

KIT 1 I send you Soldering Equipment and Radio Parts; show you how to do Radio soldering; how to mount and connect Radio parts; give you practical experience.

KIT 2 Early in my course I show you how to build this N. R. I. Tester with parts I send. It soon helps you fix neighborhood Radios and earn EXTRA money in spare time.



Be a RADIO Technician

Learn by PRACTICING in Spare Time

with 6 BIG KITS of RADIO PARTS I send you

Do you want a good-pay job in the fast-growing Radio Industry—or your own Radio Shop? Mail the Coupon for a Sample Lesson and my 64-page book, "Win Rich Rewards in Radio," both FREE. See how I will train you at home—how you get practical Radio experience building, testing radio circuits with 6 BIG KITS OF PARTS I send!

Many Beginners Soon Make Extra Money in Spare Time While Learning

The day you enroll I start sending EXTRA MONEY JOB SHEETS that show how to make EXTRA money fixing neighbors' Radios in spare time while still learning! It's probably easier to get started now than ever before, because the Radio Repair Business is booming. Trained Radio Technicians also find profitable opportunities in Police, Aviation, Marine Radio, Broadcasting, Radio Manufacturing, Public Address work. Think of even greater opportunities as Television, FM, and Electronic devices become available to the public! Send for FREE books now!

Find Out What NRI Can Do For You

Mail Coupon for Sample Lesson and my FREE 64-page book. Read the details about my Course; letters from men I trained; see how quickly, easily you can get started. No obligation! Just MAIL COUPON NOW in envelope or paste on penny postal. J. E. SMITH, President, Dept. 6NR, National Radio Institute, Pioneer Home Study Radio School, Washington 9, D. C.

Our 32nd Year of Training Men for Success in Radio

Sample Lesson **FREE**
64 Page Book

MR. J. E. SMITH, President, Dept. 6NR
National Radio Institute, Washington 9, D. C.

Mail me FREE, Sample Lesson and 64-page book about how to win success in Radio and Television—Electronics. (No salesman will call. Please write plainly.)

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Address.....

City..... State.....

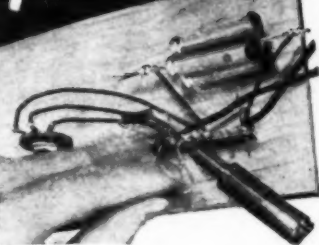
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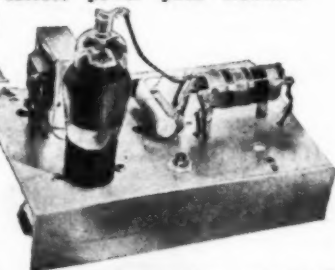
Approved for Training under GI Bill

KIT 3

You get parts to build Radio Circuits; then test them; see how they work, learn how to design special circuits; how to locate and repair circuit defects.



KIT 4 You get parts to build this Vacuum Tube Power Pack; make changes which give you experience with packs of many kinds; learn to correct power pack troubles.



KIT 5 Building this A. M. Signal Generator gives you more valuable experience. It provides amplitude-modulated signals for many tests and experiments.



KIT 6 You build this Superheterodyne Receiver which brings in local and distant stations—and gives you more experience to help you win success in Radio.

My Course
Includes Training in
TELEVISION • ELECTRONICS
FREQUENCY MODULATION

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COVER PHOTO

By Walter Steinhard
Staff Photographer

Production line at the New York City Plant of Hammarlund Manufacturing Company. Here a worker adds a part to the HQ-129X amateur radio receiver as line moves along slowly.



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GIVES YOU 8 BIG KITS OF RADIO EQUIPMENT



WITH A **COMPLETE 6 TUBE SUPER-HETERODYNE RECEIVER**

YOU LEARN RADIO SERVICING
THROUGH INTENSIVE "SHOP-BENCH" PRACTICE

YOU DO EXPERIMENTS, CONSTRUCTION, TROUBLE-SHOOTING

I'll show you how to perform over 175 instructive Experiments—how to build countless Radio Circuits. You'll learn a new, fast way to test Radio Sets without mfg. Equipment.

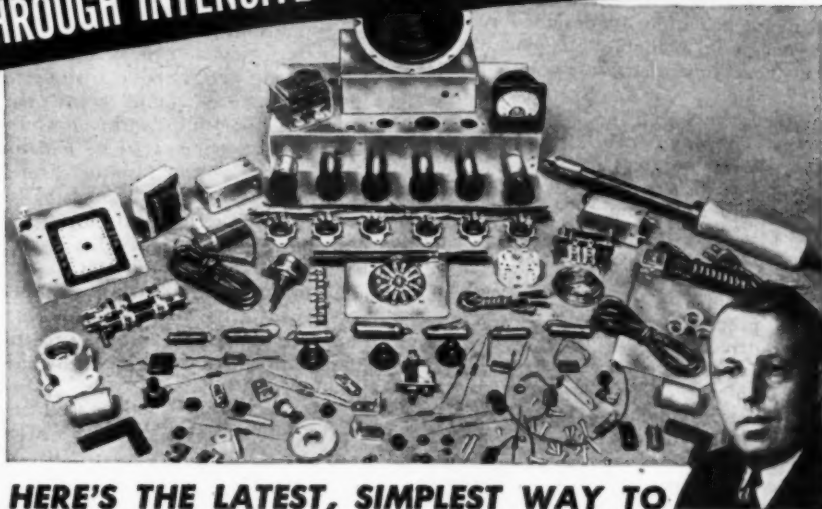


I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional accuracy and speed.

You'll get valuable experience and practice building this Signal Generator and multi-purpose Tester. Makes a breeze out of fixing Radios and you don't have to spend money on outside, ready-made equipment.



Soldering, wiring, connecting Radio parts . . . building circuits with your own hands—you can't beat this method of learning. When you construct this Rectifier and Filter, Resistor and Condenser Tester, etc., you get a really practical slant on Radio that leads to a money-making future.



HERE'S THE LATEST, SIMPLEST WAY TO TRAIN at HOME for a GOOD LIVING in RADIO-ELECTRONICS & TELEVISION

I train your mind by putting you to work with your hands on a big 6-Tube Superheterodyne Receiver. And, believe me, when you get busy with real Radio Parts—8 big Kits of them—you really LEARN Radio and learn it RIGHT! You get the practical stuff you need to be useful in Radio, and that's what it takes to make money. You don't have to worry about what to do with these 8 Kits of Parts. Step by step, I show you how to build circuits, test, experiment, trouble-shoot. And you don't need any previous experience. The Sprayberry Course starts right at the beginning of Radio! You can't get lost! Simplified lessons, coupled

with real "Shop" practice, makes every subject plain and easy to understand and remember.

A BUSINESS OF YOUR OWN . . . OR A GOOD RADIO JOB

Soon after you begin Sprayberry Training, I'll send you my sensational BUSINESS BUILDERS. You'll find out how to get and do neighborhood Radio repair jobs for nice profits and rich experience while learning. This sort of work can easily pave the way for a Radio Service business of your own. But with Sprayberry Training, you're not limited. You can swing into any one of the swiftly expanding branches of Radio-Electronics INCLUDING Radio, Television, FM, Radar, Industrial Electronics. Be wise! Decide now to become a fully qualified RADIO-ELECTRONICIAN. Get full details about my Training at once! Mail coupon below for my 2 big FREE Books.

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Here's a valuable and wonderfully complete new book which explains in simple English how to read and understand any Radio Set Diagram. Includes translation of all Radio symbols. Send for this volume at once! It's free! Along with it, I will send you another Big Free book describing in detail my Radio-Electronic Training.



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Please rush my FREE copies of "How to MAKE MONEY in RADIO, ELECTRONICS and TELEVISION," and "HOW to READ RADIO DIAGRAMS and SYMBOLS."

Name Age

Address

City State

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**YOU ARE IN DOUBT ABOUT
THE RIGHT PART TO USE . . .**



We suggest that you utilize the BUD catalog to remove these doubts. A complete line of scientifically designed radio components is available for your use. See them at your distributors.

These flexible shafts simplify panel control problems. Both lengths are remarkably free from backlash and will turn at any angle up to 90°.



Flexible Shaft Couplings

A precision-built gear driven dial designed for use on electron-coupled oscillators, frequency meters, receivers and other instruments where extreme accuracy of calibration is necessary — D-1729



Vernier Dial

This heavy duty R.F. transmitting choke is especially intended for use in high powered transmitter plate circuits. All chokes are coated with a moisture absorption preventing ceramic coating. Momentary overload may be withstood without collapsing individual pies.



Transmitting Choke

BUD PRODUCTS ARE BACKED BY 18 YEARS OF DEPENDABLE SERVICE AND HAVE PROVED, IN USE, THAT THEY ARE BUILT TO "TAKE IT."



BUD RADIO, INC.

CLEVELAND 3, OHIO

For the RECORD.

BY THE EDITOR

THE amazing advances that have taken place in the field of electronics in recent years, coupled with a tendency for dealers to operate their own repair shops, have given many an independent radio serviceman qualms regarding his ability to retain his present position. We feel such fears are not justified, as can be seen from the following impartial analysis of the situation.

A large number of conventional broadcast receivers will be manufactured and put into use during the next few years. These receivers may be serviced in conventional ways. These, in addition to receivers now in use, will provide a very large chunk of servicing business. It is very likely that independent repair shops will handle the majority of this business.

For the progressive serviceman who is willing to spend some time and money studying and acquiring new equipment, there will be FM and television receivers to install and service. However, no attempt should be made to service such equipment without adequate knowledge of the circuits and theory involved, and without suitable equipment. Particularly in television receivers, the techniques of servicing and locating faults are quite different from those used in conventional broadcast receivers.

There is a very broad and profitable field opening up to the enterprising serviceman as a result of the growing public consciousness of the importance and reliability of electronic devices. This is the field of "gadgets" for the convenience, safety, protection, or amusement of the customer. Such items as photocell-operated or capacity-operated burglar protection devices, garage door openers, automatic devices for turning the radio on and off at a predetermined time, and electronic devices for playing various tricks on guests, all fit into this category. In general, no ready-made equipment is available for these various applications, which gives the serviceman a splendid opportunity to build units to suit the customer's particular need. Each installation will be different, and will require individual attention. These devices are not difficult to build and do not require more than average radio knowledge and skill.

To properly exploit this idea, the serviceman must acquaint his prospective customers with the possibilities of these various gadgets. This, of course, means advertising. If various service shops throughout the country had been equipped to provide burglar protection for homes, and had advertised this fact, they would have been flooded

with orders following the Degan kidnapping case in Chicago. It is a relatively simple matter to set up an infrared light source, suitable mirrors, and a photoelectric cell relay arranged in such a manner as to set off an alarm, turn on a light, or perform any desired function if an intruder steps into a room and breaks the beam of light. Installations of this kind could prove very profitable to the installer, and it should not prove too difficult to secure this business.

Automatic garage-door openers could also prove to be a profitable side-line. A system for this purpose must, of course, be made burglar-proof. This could be done by the use of one or two step relays, together with a coding system, so that a certain combination of flashes of long and/or short duration and no other would serve to open the doors. The photocell could be recessed in a long tube so the car lights would operate it in the daytime as well as at night. A miniature transmitter located in the car and a suitable receiver in the garage, again with a coding system, could also be devised to perform the same function.

Many people would like to fool their guests by apparently having a special "request" program suddenly appear on the radio. This may be accomplished by using a miniature transmitter of the type used in wireless record players, together with a suitable recording containing the "request" and the "program." This could be remotely controlled, and the receiver tuned to the correct spot.

There are innumerable ideas of this kind which will immediately become apparent to the mind of the reader. More specific information on many of these ideas, including circuit diagrams and construction details, will appear from time to time in RADIO NEWS.

A good deal of the industrial electronic control equipment now in use and to be installed in the near future is not much more—and sometimes much less—complicated than the average radio receiver. Large factories using this equipment will, of course, hire their own repairmen to keep such equipment in order. However, in many communities, there are smaller factories using only one or two pieces of electronic equipment. They cannot hire a repairman for the sole purpose of keeping this equipment in repair, and so there is an excellent opportunity for the radio repair shop in the vicinity to contract for this service. An excessive amount of study or additional expensive equipment should not be required in order to do an excellent job.

(Continued on page 142)

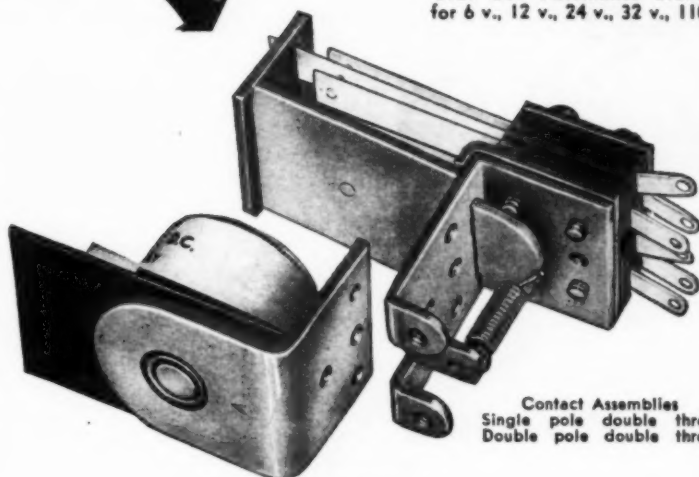


New!

A RELAY BY GUARDIAN with Interchangeable Coils

BUILT IN TWO PARTS

★Two basic parts—a coil assembly and a contact assembly—comprise this simple, yet versatile relay. The coil assembly consists of the coil and field piece. The contact assembly consists of switch blades, armature, return spring, and mounting bracket. The coil and contact assembly are easily aligned by two locator pins on the back end of the contact assembly which fit into two holes on the coil assembly. They are then rigidly held together with the two screws and lock washers. Assembly takes only a few seconds and requires no adjustment on factory built units.



A.C. Coil Assemblies available
for 6 v., 12 v., 24 v., 115 v.
D.C. Coil Assemblies available
for 6 v., 12 v., 24 v., 32 v., 110 v.

Contact Assemblies
Single pole double throw
Double pole double throw

SERIES 200 RELAY

On Sale at Your Nearest Jobber NOW!

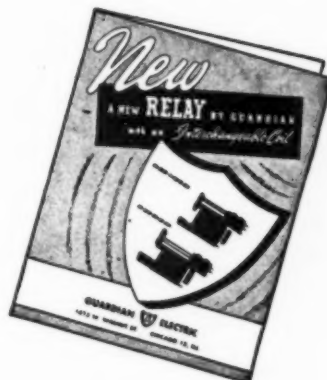
See it today! . . . this amazing new relay with interchangeable coils. See how you can operate it on any of nine different a-c or d-c voltages—simply by changing the coil. Ideal for experimenters, inventors, engineers.

TWO CONTACT ASSEMBLIES

The Series 200 is available with a single pole double throw, or a double pole double throw contact assembly. In addition, a set of Series 200 Contact Switch Parts, which you can buy separately, enables you to build dozens of other combinations. Instructions in each box.

NINE COIL ASSEMBLIES

Four a-c coils and five d-c coils are available. Interchangeability of coils enables you to operate the Series 200 relay on one voltage or current and change it over to operate on another type simply by changing coils.



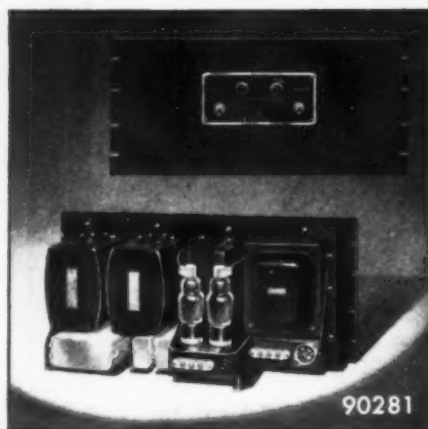
Your jobber has this sensational new relay on sale now. Ask him about it. Or write for descriptive bulletin.

GUARDIAN ELECTRIC
1630-P W. WALNUT STREET CHICAGO 12, ILLINOIS
A COMPLETE LINE OF RELAYS SERVING AMERICAN INDUSTRY

Designed for



Application



The No. 90281

High Voltage Power Supply

The No. 90281 high voltage power supply has a d.c. output of 700 volts, with maximum current of 250 ma. In addition, AC filament power of 6.3 volts at 4 amperes is also available so that this power supply is an ideal unit for use with transmitters, such as the Millen No. 90800, as well as general laboratory purposes.

The power supply uses two No. 816 rectifiers and has a two section π filter with 10 henry General Electric chokes and a 2-2-10 mfd. bank of 1000 volt General Electric Pyranol capacitors. The panel is standard $8\frac{3}{4}'' \times 19''$ rack mounting.

**JAMES MILLEN
MFG. CO., INC.**

MAIN OFFICE AND FACTORY
**MALDEN
MASSACHUSETTS**



Spot Radio News

★ Presenting latest information on the Radio Industry.

By FRED HAMLIN

Washington Editor, RADIO NEWS

IF RADIO doesn't have the biggest year in its history in 1947—even better than 1946—it will not be the industry's fault. According to plans which have been flowering since fall and will come into full bloom early next year, retail sales will be backed by one of the biggest national advertising campaigns of all time. Not only will the industry advertise widely, but radio ads will also be spread broadcast by the National Retail Drygoods Association, representing all the larger department stores; the National Retail Furniture Association, representing 8000 outlets, and the National Association of Music Merchants, with 7000 additional outlets . . . the theme of the sales drive, in case you haven't already heard, is "A Radio in Every Room for Every Purpose." Radios are being designed to back up the theme.

PRODUCTION, if figures available as this goes to press are any indication, will also back up the campaign—and how! Before the end of the summer, production totals had broken the records both for the industry and as against prewar averages, surging approximately to the million-and-a-half unit mark per month by the end of August. Better still, and continuing steadily into the fall, production of consoles and radio-phonographs rose substantially. Table models of the electric type continued to dominate the totals, coming off the line at the rate of a million a month. Even FM sets and television receivers showed steady gains, despite continued difficulties in getting all necessary parts. Wood cabinets continued to lead the list of short items.

WITH THE RECEIVING end of the industry thus on the boom, FCC year-end summaries indicate an equally expansive year in the broadcasting field. Things are moving so fast that it is difficult to keep up with them, but if the number of stations now on the air or licensed to go on the air stay in business, and the applications in FCC files are granted, there will be more than three thousand outlets in operation by the end of 1947—more than five times the six hundred-odd broadcasting stations ten years ago. Three thousand is, of course, a somewhat inflated figure, since some of the new stations will not survive and a sub-

stantial percentage of the applications will fall by the wayside. But at worst, on FCC conservative estimates, there will be more than two thousand in business before mid-'47—not bad any way you look at it.

WITH DOMESTIC PRODUCTION showing signs of catching up with demand, if not outstripping it, during 1947, interest is heightening in outlets abroad. Wheels are already turning on this problem, both toward the manufacture of models designed for foreign markets and toward market research to discover where purchasers will be the most numerous and enthusiastic. Spearheading the research are the Radio Manufacturers Association and the Bureau of Foreign and Domestic Commerce of the Department of Commerce. Indications are good that first target will be the South American market, and for two excellent reasons: not hard-hit by the war, populations south of the Rio Grande are in better shape economically to buy radio equipment; and—because of the war—they have not been able to get a supply to meet the demand.

BEST CUSTOMER among South American and Central American countries is Brazil, followed by Mexico, Chile, Columbia, Cuba. Worst is Argentina, which has a radio industry that is supplying domestic needs and looking at the foreign market, too. These and other facts about the South American radio market are to be found in a book called "Latin-America Radio Receiver Markets—Merchandising, Design, and Digest of Tariff System," by Mort N. Lansing of the general products division, commodities branch, Bureau of Foreign and Domestic Commerce, Washington. The book is under the imprimatur of the Federal Government Printing Office and is considered so important to U. S. manufacturers that RMA is sending a copy to every one of its members . . . Regardless that Brazil is the best customer south of the line, our best prewar buyer was Mexico, who bought almost a hundred per-cent of its sets from U. S. makers. Farther south, before the war, stiffest competitor—you'll never guess—was Holland, but the Dutch are not reckoned as tough rivals at least for the next few years, owing to their problems in repairing

RADIO NEWS



The Crown Princess



*S*atin walnut finish

accented by an edge-lighted dial gives this new Air King radio-phonograph a beauty of appearance equalled only by the purity and naturalness of its tone. Styled with simple dignity, it fits naturally into any decorative scheme. Engineered by Air King, it wins the enthusiasm of the critical musician. And, produced by Air King, its quality demands no penalty of price.

Features that make the Crown Princess a superlative instrument include:—

Six tube (including rectifier) superheterodyne for standard broadcast. Two dual-purpose tubes give eight-tube reception. AC or DC. Automatic changer for ten- or twelve-inch records. Permanent Alnico No. 5 magnet speaker. Featherweight, low-pressure tone arm. Permanent needle. Crystal pick-up. Automatic volume control. Full range tone control. Beam power output. Built-in loop aerial.

The Royalty of Radio Since 1920

AIR KING

RADIO

Brooklyn

Division of

HYTRON RADIO & ELECTRONICS CORPORATION

The Regent Family of Radio



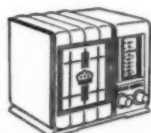
THE Regent



THE Crown Prince



THE Duchess



THE Marquis



THE Baron

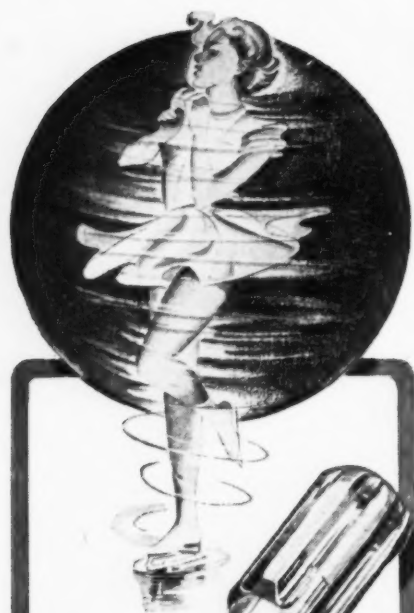


THE Baronet



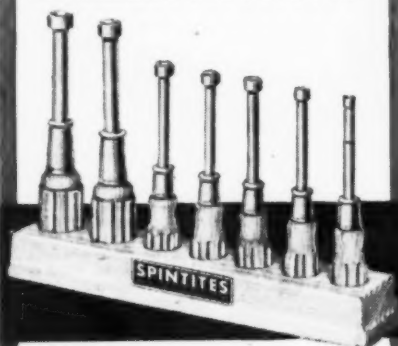
THE Royal Highlander

December, 1946



The
Original
**SPINTITE
WRENCH**
SPINS With
Ease and Speed

Encourages nimble hands
along the assembly line.
Made in eleven sizes from
3/16" to 5/8" square, hex
or knurled



POPULAR Wood
SPINTITE Handles
T-73 SET

A useful Tool in every
Radio and Electrical Shop.

Deluxe T-8 SET the same
with Plastic Handles

Send for Catalog
141 picturing Au-
craft Radio and
Automobile Tools.

WALDEN
WORCESTER
WRENCHES

STEVENS WALDEN, INC.
468 SHREWSBURY STREET
WORCESTER, MASSACHUSETTS

damages done by the war. Whoever competes with us—don't underestimate either the Argentine or Britain—indications now are that we'll get the biggest share of the business for some time to come—and exports in the radio field for 1947 to South America are estimated at \$16,900,000 by Mr. Lansing.

ARGENTINA ISN'T THE ONLY NATION active in radio, according to scattered reports trickling into Washington from abroad. Russia, hailing itself as "the birthplace of radio" on the basis of the set demonstrated May 7, 1895, by Alexander Stephanovich Popov (that's what they say, boss!)—Russia now claims "the most powerful station in the world" at Moscow and (potentially) more receiving sets than you can shake a stick at. Newest Muscovite radio gadget—a receiver designed to fit on the handlebars of a bicycle, designed by a ham. Hams are steadily increasing in numbers in the USSR, according to the reports . . . Although not considered a formidable factor in the foreign market, France's radio industry is reportedly staging an impressive comeback to supply the domestic market. England, as indicated above, is moving rapidly enough to become a competitor worth watching in the export field.

RADIO SCIENTISTS almost daily reach farther into the stellar spaces, reporting events of such Buck Rogers proportions that the average observer can only come to one conclusion—anything can happen, and probably will before this gets to press. Among the most recent believe-it-or-nots is the statement by Grote Reber of Wheaton, Illinois, practically a next-door neighbor to our home office, that he has picked up signals from the Milky Way which he estimates have been enroute to earth as much as a thousand years. Mr. Reber didn't pick up the signals with a crystal set—used a sheet-metal mirror 31.4 feet in diameter and 20 feet in focal length which focuses the long-wave radio radiation which it collects from a systematic scanning of the sky. These radio waves originating outside the earth are called cosmic static and make a hissing sound similar to the boiling of a teakettle. Mr. Reber has found that at 160 mc. the sound is very strong in the direction of the Milky Way. Cosmic static, he reports, has a high intensity for the frequencies used by long-distance, short-wave commercial stations. It is weaker in the FM and television frequencies, faint at the lower radar frequencies, and fades out in the higher radar frequencies.

BIKINI BY-PRODUCTS are as numerous as the lessons learned at Operation Crossroads, but at least one that has an optimistic ring for those interested in radio turned up recently in the wake of the atom bomb tests. Jobs are waiting for men interested in

the field of radiological safety—the problem of protecting ships and personnel contaminated by an A-bomb blast. A school is already in operation to train experts in the field, with headquarters in Washington. It is in charge of Commander Draper L. Kauffman. Special problems of ship decontamination presented by the Crossroads vessels and the lessons learned at Bikini, plus fundamental concepts of nuclear physics, form the basis for instruction at the school. First students were Army, Navy, and Public Health officers. Faculty includes some of the outstanding A-bomb specialists—Lt. Col. A. Roth of the Army Ground Forces, Lt. Col. J. M. Talbot of the AAF, Commander E. G. Williams of the U. S. Public Health Service, Dr. G. Dessauer of the University of Rochester, Dr. R. J. Stephenson of Wooster College and Dr. M. L. Pool of Ohio State University. All actively participated at Operation Crossroads. Promising graduates of the course will be added to the faculty and other schools may be opened elsewhere in the country. Training techniques and a manual of instruction are being developed.

FROM FCC COMES WORD that the new table of service-allocation of frequencies between 25,000 kc. and 30,000,000 kc., approved early this fall, seems to be working out to everybody's satisfaction. Among the changes was the allocation of a new band for navigation radar aids between 5250 and 5650 mc., with merchant marine radar limited to 5460 to 5650 mc. The former 400 mc. amateur service band between 5250 and 5650 mc. was replaced by 200 mc. bands at 3300-3500 mc. and 5650-5850 mc. Non-government fixed and mobile services, who thus lost the 5650-5850 mc. band, were compensated with the band 3500-3700 mc. Provision was made for development and experimental work in radar by the merchant marine by allocation of the bands 3000-3246 mc. and 9320-9500 mc., in addition to 5460-5650 mc. The exclusion of the aeronautical mobile service from the international allocation for the non-government fixed and mobile bands above 1000 mc. was eliminated, as was the exclusion of non-government services from the radar navigation aids bands 8500-9300 mc. and 9600-10,000 mc.

THE FACSIMILE COMMITTEE in their report to the NAB convention held in Chicago revealed that the industry has agreed on several standards which will be submitted to the FCC. Briefly these are: page size, degree of definition, the speed and timing signal by which the station broadcasting facsimile controls the alignment of the page received by radio facsimile. Agreement on these points represents 10 months' work by this RMA committee and as a result it should push facsimile along at a more rapid pace.

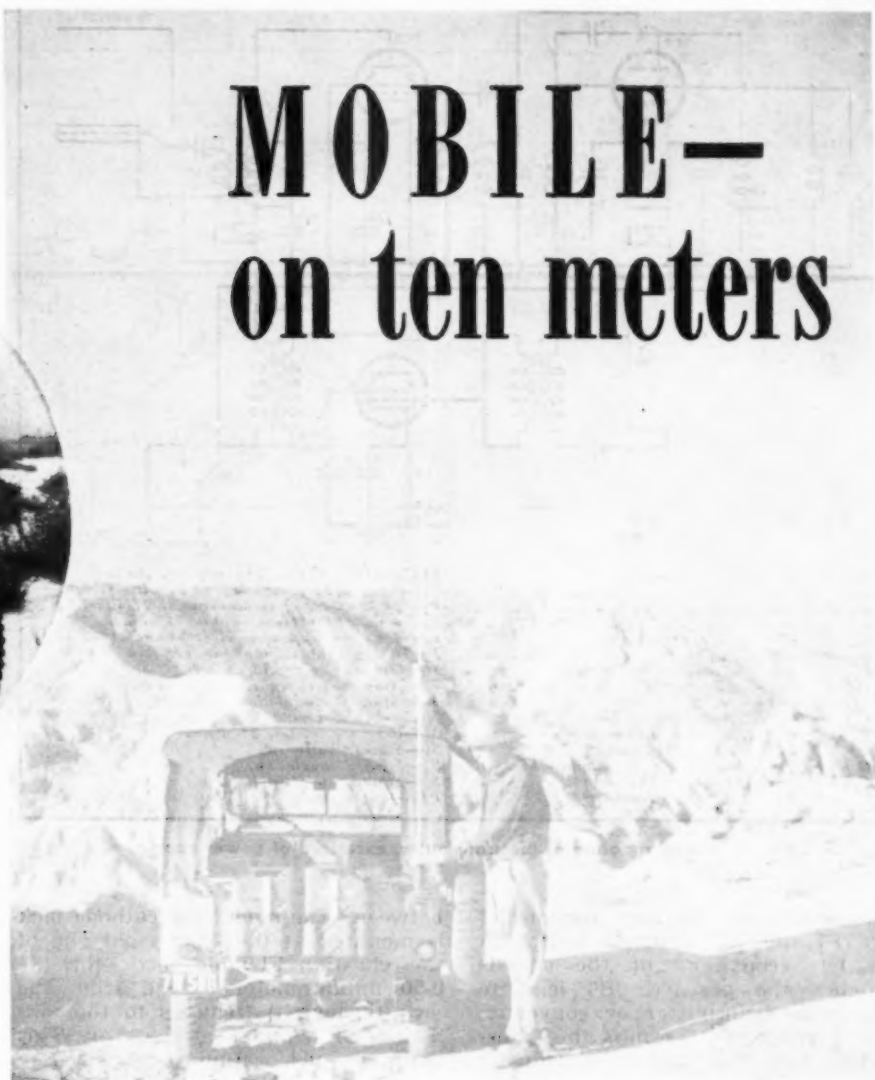


By

WALTER B. FORD, W6YT



(Above) On mobile or stationary operation contacts are readily made. Here the writer takes time out for a DX report before proceeding up a wash. (Right) Extending the sixteen foot flexible tank antenna.



MOBILE— on ten meters

***A rugged, reliable 10 meter transmitter
and converter for fixed or mobile uses.***

IT'S a far cry from the comparatively cool paved highways of the West Coast where the writer lives, to the sandy arroyos and washes of the Mohave and Colorado deserts in southeastern California, where the writer has been making archeological studies for the past few years, and where the summer temperature often passes the 130 degree mark. On pre-war expeditions into those areas in regular stock cars it was rarely possible to venture far from a traveled road, but with a sturdy jeep becoming available a vast new field for desert exploration was opened. Along with the possibilities for reaching those heretofore inaccessible regions, came the realization that each mile extended from the beaten path increased the hazards of desert travel, a fall resulting in a broken bone, a bite from a poisonous insect or reptile, a sudden cloudburst, heat prostration—any of which might create an emergency that would make communication with the outside world most imperative. It was with that thought in mind that the mobile equipment herein described was built and installed in the writer's jeep.

All of the equipment was designed around parts that were on hand, or were immediately available from surplus Army and Navy stock. From the

writer's viewpoint there is nothing more discouraging than to plan a piece of equipment and then find that owing to the lack of some essential part it cannot be completed. In planning the transmitter only such power that would be consistent with a nominal drain on the car battery was considered. Although an extra battery could be carried on some trips, the camping equipment required for extended stays does not permit any space for that added luxury. The next consideration was the physical size of the transmitting and receiving units, both of which were required to fit into a metal cabinet, size 10" x 10" x 19½", and yet allow ample room for operating the equipment and storing key, microphone, and microphone batteries.

The transmitter is built upon a manufactured chassis measuring 5" x 9" x 3". The tube line-up beginning at the left is a 7F7 oscillator and doubler, a 7C5 doubler and amplifier, and a 7C5 modulator. Of the many

tubes available from the supply on hand, that combination seemed to offer the best possibilities relative to compactness and power output. A 6V6 could have been substituted for the 7C5 final amplifier, but for the sake of uniformity local tubes were desired throughout. In order to keep the size of the chassis within requirements, it was necessary to mount the oscillator tuning condenser and speech gain control, with their associated jacks, at the right end of the chassis. All are readily accessible, however, and provide space that otherwise would be lacking with conventional front panel mounting. While a neat appearing lay-out was desired, symmetry was of secondary importance to short r.f. leads. The microphone jack is mounted at the rear of the left end of the chassis, with the gain control directly below. A switch on the gain control turns the tube filaments on or off. At the same end are mounted the oscillator tuning condenser and jack for measuring the

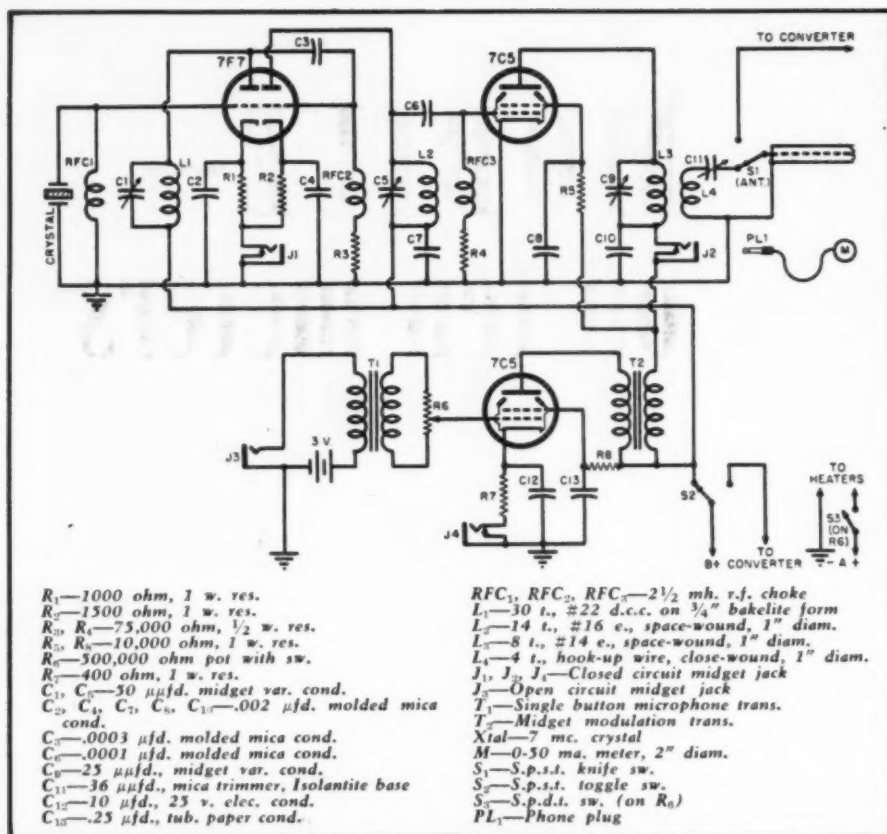
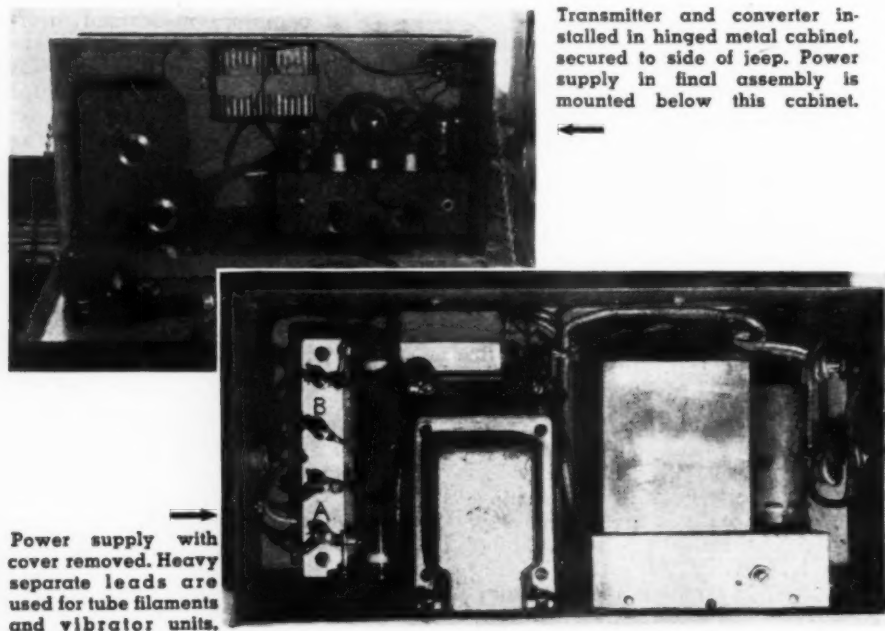


Fig. 1. Wiring diagram of the transmitter, exclusive of power supply.

cathode current for both sections of the 7F7 tube. The toggle switch at the left front end of the chassis switches the positive "B" lead to either the transmitter or converter. That arrangement permits the transmitting tube filaments to remain hot while receiving and makes the converter inoperative when the transmitter is in operation. The doubler and final amplifier condensers are mounted below their respective coils, with the amplifier plate current jack in

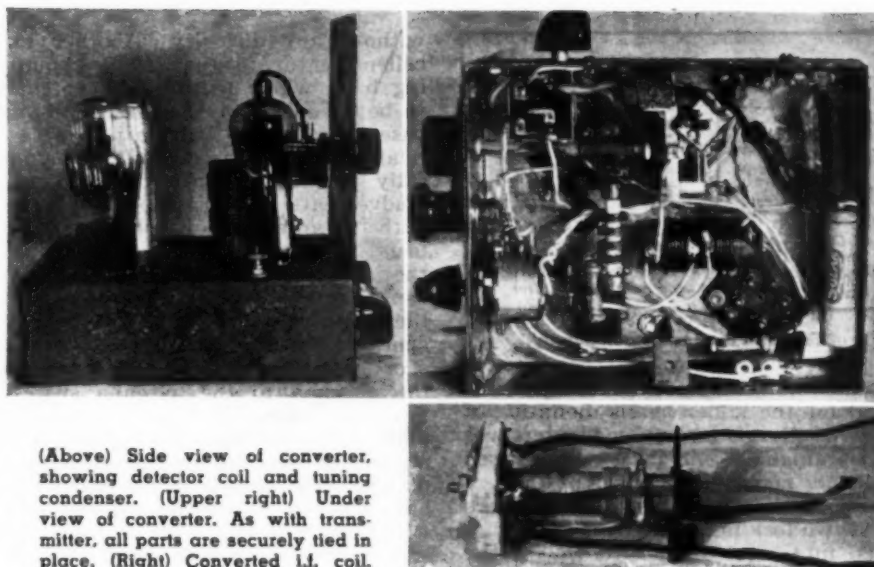
between. The modulator cathode jack is mounted at the front right end of the chassis. Flexible leads for the 0-50 milliammeter extend from the jack through the chassis to the milliammeter mounted at the rear. This permits quick retuning whenever a crystal is changed and allows the operating condition of a tube to be checked at any time. The crystal is mounted in a tube socket directly back of the oscillator tube. The 20 meter and 10 meter coils are air



wound and mounted on low loss dielectric strips to banana plugs. Through-panel stand-off insulators provide jacks for the plug-in coils. Plug-in type coils were provided so that the transmitter could be operated on other frequencies at a stationary location. The transmitter is easily removed from the larger cabinet and makes an excellent stand-by transmitter for the home station. The antenna pick-up coil and trimmer condenser are mounted on small stand-off insulators directly back of the modulator tube. On mobile operation over rough roads vibration of the 20 meter coil was found to cause a frequency flutter. By reinforcing the coil with two strips of thin plastic and plastic cement it was made perfectly stable. The power leads terminate in a four-prong wafer socket at the right end of the chassis, which matches a hole for the power plug in the metal cabinet. The bottom view shows the general placement of the parts. The sockets were wired in first, after which the fixed condensers, resistors, and r.f. choke coils were installed. Mounting strips were used generously to eliminate the possibility of floating parts and connections. Also, a lock washer was placed under every machine screw nut. When the sockets were being connected short leads were soldered to all terminals that were to be connected to jacks or variable condensers. That procedure did away with the necessity of trying to solder terminals hidden by wires, resistors or condensers. The variable condensers were next installed and connected, followed by the jacks, "B" power switch, and gain control. The original plans called for dial locks on the variable condensers, but turning the shafts by hand indicated that the condensers might be tight enough to hold their settings without the use of locks. That conclusion proved to be justified when the jeep was driven over some mighty rough territory without the slightest shifting of the condenser from its original setting. Undoubtedly, the dial locks would be desirable where it was desired to maintain a fixed operating frequency, but with a large number of 40 meter band crystals on hand it is a simple matter to retune to another frequency whenever a more powerful station is operating on the original frequency. The modulation and microphone transformers were next mounted on the back of the chassis and connected. The microphone transformer is shown at the extreme right of the bottom view. The 40 meter oscillator coil, which consists of 30 turns of No. 24 d.c.c. wire wound on a 3/4" bakelite rod, is mounted directly ahead of the modulation transformer. Previous calculations gave 35 turns as the correct number, but that was later trimmed to 30 turns to give a more satisfactory LC ratio. The microphone battery leads and the filament and power leads for the converter are brought out at the left rear side of the chassis.

When choosing a power supply for a low-power mobile transmitter, the set constructor must decide between a motor generator and a vibrator unit. Proponents of either method can readily point out the advantages of their particular choice, but in the writer's case the matter was easily decided by having a *Mallory* vibrator unit on hand from a prewar radio controlled boat rig. A visit to the local war surplus store provided a metal case with a cover that would take the vibrator unit and filter system and leave little unused space. Holes were drilled in the cover to provide for ventilation and a handle was made from a piece of strap iron to facilitate moving the unit. A switch in the base of power unit controls the output voltage and permits the power output of the transmitter to be adjusted to meet the conditions under which the particular transmission is taking place. That adjustment may be made quickly through a hole in the cover. No. 12 stranded wire was used for the battery leads, separate leads being provided for the tube filaments and for the vibrator. Previous experience with portable vibrator power supplies proved the advisability of keeping the filament and vibrator leads separate. When single leads are used the varying voltage drop caused by the vibrator may cause the transmitter to be modulated at the vibrator frequency. Likewise, a hard-to-eliminate hash is apt to appear in the receiver when the same power unit is used. The power and filament leads were brought to a bakelite terminal strip, from which they extend to the transmitter chassis through a four-wire laced cable. Since the power supply can be placed directly below the transmitter, it was found that No. 18 stranded wire could be used for the leads to the transmitter with negligible voltage drop. Both transmitter and converter have their own filament switches, so none was provided for in the power supply. The vibrator unit has its own r.f. filter built within, hence no trouble was experienced with vibrator hash in either the converter or transmitter. However, the lack of interference in the converter-receiver may be due more to the particular combination of converter and car radio, rather than to the filter within the vibrator unit. The power supply was loaned to a friend who was building a similar mobile unit for his car and only after an additional r.f. filter was installed in the power supply was the annoying hash in the receiver eliminated. The filter consisted of 20 turns of No. 12 wire wound on a three-fourths inch dowel, connected in the positive battery lead close to the vibrator, and by-passed to ground with a .25 μ d. condenser.

In determining the type of receiver to use with the mobile unit, space requirements ruled out any thought of a separate receiver. Previous experience with both separate receivers and converters proved that the latter



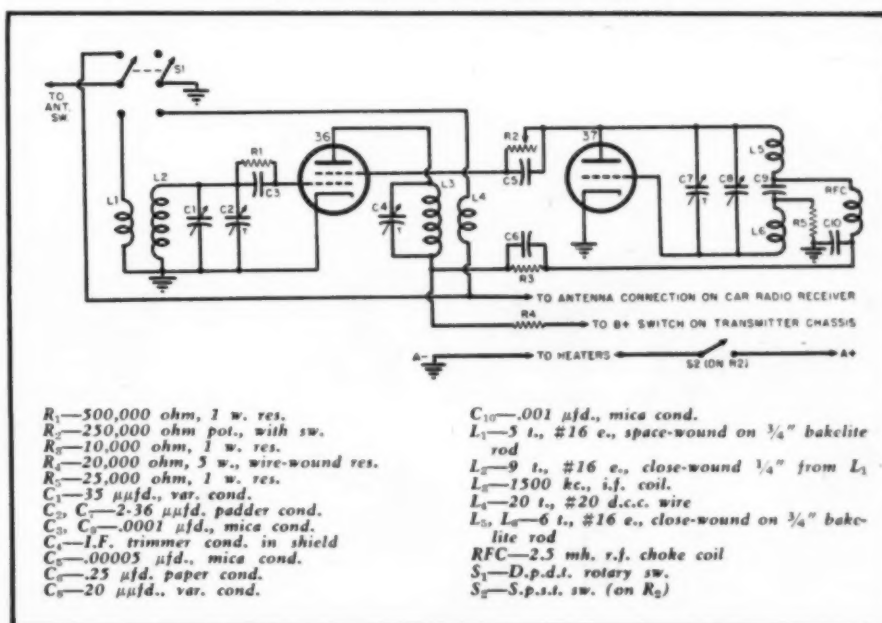
(Above) Side view of converter, showing detector coil and tuning condenser. (Upper right) Under view of converter. As with transmitter, all parts are securely tied in place. (Right) Converted i.f. coil.

could function as satisfactorily as the former, particularly when used with a good car receiver. It was originally planned to make the converter a one-tube affair, using either a heptode or a hexode converter, but inquiries to the local supply houses quickly demonstrated that the unit would have to be designed around a different type of tube. The writer's own supply of tubes revealed several each of the original automobile type tubes, 36's and 37's, so it was decided to assemble a temporary set to put the tubes to a test. The results were so satisfactory that the tubes were soon functioning in a permanent converter, which when compared with one-tube converters of the past leaves nothing to be desired. It oscillates smoothly over the entire band, has much more sensitivity than can be utilized, and operates with one main tuning control, it being necessary to adjust the detector tuning condenser only occasionally. And last-

ly, there is a plentiful supply of spares on hand, which is of no small importance when the purpose of the installation is considered.

The detector and oscillator coils are wound on three-fourths inch bakelite rod. The detector coil is mounted vertically on top of the chassis, adjacent to its tuning condenser and trimmer. The oscillator coil is mounted underneath the chassis, next to the oscillator tuning condenser. The two sections of the oscillator coil are space wound, both in the same direction. There is a space of one-fourth inch between the two coils. The oscillator tuning condenser shaft is extended through the front panel with a piece of polystyrene rod. The d.p.d.t. switch which changes the car radio from regular broadcast to the converter is located on the right-hand flange of the chassis. The potentiometer, R_2 , serves as a volume control when the converter is operated out of reach of the

Fig. 2. Wiring diagram of the converter.



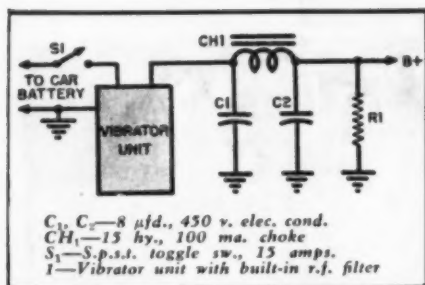


Fig. 3. Vibrator power supply.

radio volume control. Since a vernier dial for the underchassis mounting of the oscillator tuning condenser was unobtainable, one was improvised with a rubber grommet, a knob, a piece of $\frac{3}{16}$ " shaft, two brass washers and two lock nuts. The rim of the dial fits into the outer groove of the grommet. To change the tension on the dial it is necessary only to adjust the position of the two locknuts inside the chassis. The coil L_1-L_2 is a converted 1500 kc. i.f. The original secondary was removed from the coil and replaced with 20 turns of No. 20 d.c.c. wire. That arrangement provided a better impedance match to the car radio input over the usual condenser coupled method, and when tried out and compared with the latter gave by far the greater pick up. The power and filament leads terminate in a four-prong wafer socket, which is connected to the transmitter by means of a laced cable.

The converter and transmitter are secured at opposite ends of a hinged metal cabinet with machine screws through the bottom of the cabinet. Either unit may be removed from the cabinet for inspection or repairs in less than a couple of minutes. A s.p.s.t. knife switch mounted directly above the end of the transmitter serves as an antenna switch. The writer was fortunate in securing a 16 foot tank antenna at a war surplus sale. They are easily installed or dismantled and are joined together in such a way that they may be used for quarter-wave or half-wave operation

without any difficulty. Another excellent feature is the flexible mounting base, which permits the antenna to be sprung at a right angle to the base without any damage to the vertical sections. Such flexibility was not fully appreciated until the jeep was inadvertently driven into the garage with the antenna fully extended. The usual operating procedure is to use the quarter-wave antenna for local contacts and mobile operation and the whole section for stationary operation in unfavorable locations. A short section of coaxial cable connects the antenna to the antenna switch. The microphone dry cells are held in place with a clamp and wing nuts and are easily removed for testing or replacing. The hinged metal cabinet is held securely to the side of the jeep with bolts and wing nuts. A hasp and lock on the cover protects the transmitter against unauthorized operation. The power supply usually is placed on the floor of the jeep directly below the transmitter, but its flexible leads permit it to be located elsewhere when the loading of other equipment makes it desirable.

Operation

The transmitter (Fig. 1) is tuned by plugging the milliammeter into the oscillator jack J_1 and adjusting C_1 for maximum current. With the meter in the same position, condenser C_2 is next tuned for resonance dip. The meter plug is next placed in the final amplifier jack and the condenser C_3 is tuned to resonance dip. The antenna coil L_1 is next coupled loosely to the final plate coil and antenna condenser C_4 , adjusted to resonance with the antenna connected. The antenna coil coupling is next readjusted until there is only a slight dip on the meter as the plate coil is tuned through resonance. The jack in the modulator cathode provides a means for checking the operation of the speech and modulator circuits and the amount of plate current drawn by the modulator tube. All of the preliminary tuning adjustments are made with the power supply control

switch set at its lowest point. A flashlight bulb and a single turn of wire are carried to facilitate retuning when a crystal is changed in the field. When it is desired to key the transmitter, a key is inserted in the crystal oscillator cathode jack, J_1 .

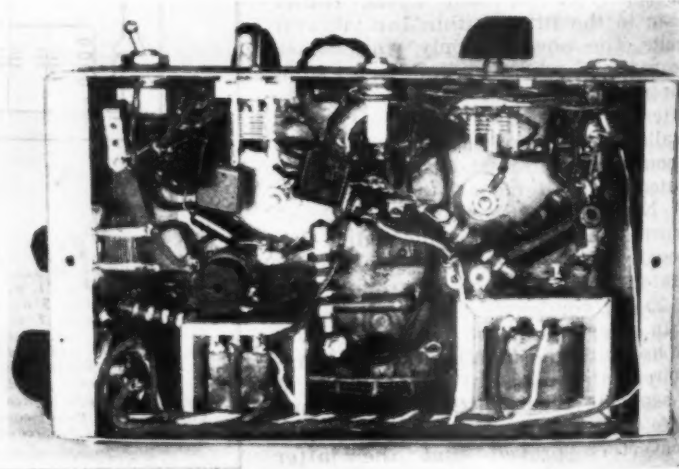
To operate the converter, Fig. 2, the car radio is first tuned to 1500 kc., after which condenser C_1 in the i.f. coil is tuned for the loudest "rushing" or background noise. Since the converter has more than ample sensitivity, the car radio may be tuned to one side or the other of an interfering broadcasting station without an appreciable loss of signal strength. The trimmer condensers, C_2 and C_3 , were set with an r.f. oscillator to give the proper bands spread in the ten-meter band. The volume control, R_2 , is the one most generally used for controlling the volume of received signals, although the regular control on the car radio may be used for the same purpose. On trips alone when mobile operation is desired, the front seat of the jeep may be removed and the metal box secured in its place. When another driver is taking the writer's place the equipment may be operated very satisfactorily in the rear of the jeep. That is the usual operating procedure.

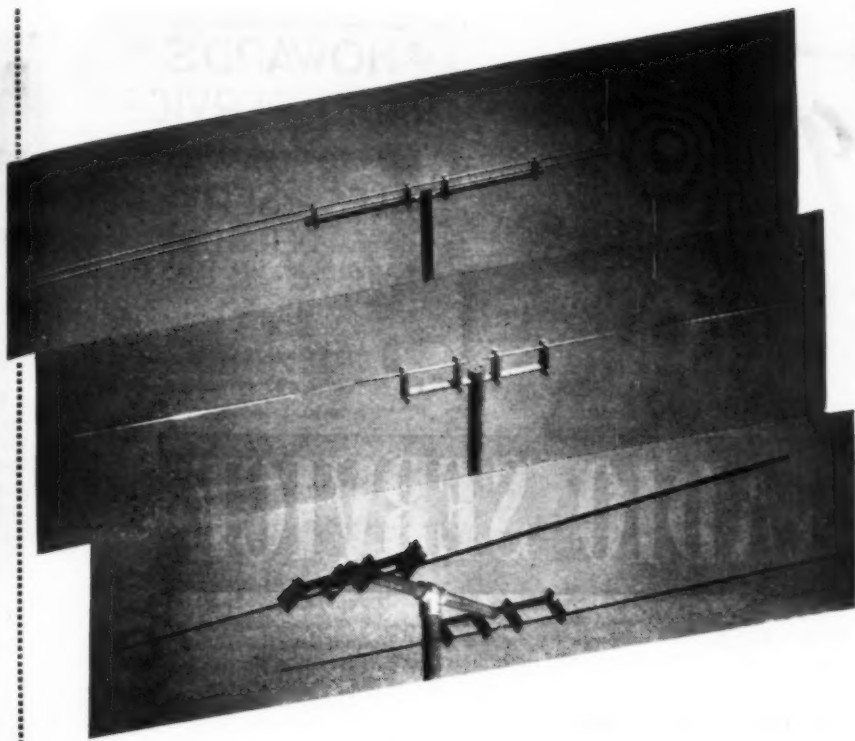
In spite of its low power, the transmitter has made many DX contacts, with a few foreign stations included. And there have been few locations where it has not been possible to make some contacts, regardless of intervening mountains or walled-in canyons. As stated in the opening of this article, the purpose of equipping the jeep with a transmitter was to provide for any contingencies that might arise on trips into the barren wastelands of California's deserts, but it is hoped that it will never be necessary to send out a QRR. If that occasion does arrive the writer is confident that the little transmitter will live up to expectations. In the meantime the pleasure derived from the many friendly contacts it has made possible has repaid the cost and labor of its construction many times. —JH—

The complete 10 meter transmitter.



Under view of the transmitter.





Photographs illustrate some of the more simple television antennas. From top to bottom: bent dipole, dipole, dipole with reflector. The more complicated arrays would include parasitic type reflectors and elaborate directors.

The Television Receiver Antenna

By J. J. TEEVAN

Although there are many types of television antennas each has its specific application. Study your installation problem and choose the antenna carefully.

WITH the increase of television sets on the market, servicemen, "hams" and radio engineers are going to be called upon more and more to erect and adjust antennas. Orders and requests will range from the single element dipole to the array complete with parasitic reflector and directors. But whatever the type desired, the basic elements of frequency discrimination, directional properties, and physical construction are still going to determine the merits of the finished job.

An antenna tuned for resonance will insure the frequency discrimination so vital to good video reception. Frequency discrimination will attenuate any unwanted signals that are removed from the resonant frequency of the antenna in question. If the television user desires his receiver to cover the whole range of transmissions in his city or area, the antenna should be made a half-wavelength long at the geometric center of the

range. First, determine the allotted range of frequencies of the television stations in the area. The geometric center of this range can then be found easily enough. Assume that the range of a certain city's stations is found to be from 50 mc. to 80 mc. Then:

(1) Range .50 to 80 mc.

(2) $\sqrt{50 \times 80} \div \sqrt{4000}$. . about 63 mc. Converting this 63 megacycles to wavelength it is found to be about 4.7 meters. Taking into consideration the difference between velocity of propagation in free space as against that in the antenna conductor, (about 10 per-cent) the corresponding wavelength of the antenna will be found to be about 4.2 meters. One-half wavelength would then be 2.1 meters. Converting this 2.1 meters we arrive at an answer of 6 feet 11 inches. The elements of the antenna must therefore be 3 feet 5.5 inches each in length.

If the order comes complete with reflector and director then the antenna element should be made a little

less . . . 95% of a half wavelength long at the operating frequency. The reflector should be a half-wavelength long at the operating frequency and the director 92% of a half-wavelength. As for the spacing between the elements place the director 0.1 wavelength in front of the antenna and the reflector 0.15 wavelength to the rear of the antenna.

To achieve physical discrimination, erect the antenna as high as physically possible, and as far removed from any type of electrical wiring as possible. Power leaks, defective neon signs and their ilk will play havoc with good video reception. Metal roofs can really be bothersome as can metal drain pipes but one cannot name all the varying disturbances that may be encountered. Each location will present problems unique to its own setting. Polarization will be determined naturally by that of the antennas at the various transmitters.

Reflections or ghost images on the television picture can be traced in most cases to one of two causes; (1) signals reaching the antenna from indirect paths and (2) faulty transmission line from the antenna to the input of the receiver.

As to the first, such signals reflected by near-by buildings and structures have traveled a greater distance than the main portion of the wave. The ghost image resulting is displaced by a time delay corresponding to this extra transmission distance. The degradation of the picture viewed corresponds to this delay and varies from a loss of fine detail to a distinct double image. To help combat this unwanted phenomenon, rotate the antenna until signals reaching it from any direction removed from that of the station desired are discriminated against. If one signal can be made to predominate sufficiently over the others, an image relatively free from ghosts will result. This applies, however, only to the reception of a signal from one station. But that kind of arrangement is not going to suit anyone who knows that there are five or six transmitting stations in his area. He isn't going to surrender his right to change programs that easily. In that case, a compromise adjustment must be found. Rotate the antenna until all the stations can be picked up with a minimum of reflections. If he desires to spend a little more, rig him up one of the rotating assemblies found in any one of several magazines these days.

An encouraging note for city dwellers has been sounded in this regard by the *Telicon Corporation*. In the system proposed by their engineers separate antennas are erected on a

(Continued on page 131)

Striking Displays

CAN SELL RADIO SERVICE

By PAUL H. WENDEL

Eastern Editor, RADIO NEWS

A good location will not speak for itself. Window displays and signs must attract your customers.



A neat, attractive window display. Located in a metropolitan area, this simple presentation packs a terrific selling punch. The display shown in the inset definitely lacks selling force. Merchandise occupying the most desirable positions in this window has no connection with radio or the service offered by this store.

ONE of the most interesting postwar trends in the radio field is the keen interest being shown by the more experienced service dealers in improved business practices and selling methods. This acute awareness of a former serious weakness of the radio service industry as a whole augurs well for the future of many of these small radio enterprises. If pursued diligently by a large number of dealers it would lead to a broad, sound retailing base for all products of the radio art and an increased importance for the service dealer as a vital part of the national radio merchandising organization. Many reasons have been advanced in an attempt to explain why radio servicemen as a class have not

been highly successful business operators. The most popular "explanation" was to the effect that good technical knowledge and skill and merchandising acumen are rarely possessed by one individual. This reasoning presumes that to be successful in either of these specialties you must have a natural "bent" for it.

Actually, successful merchandising is a reward for the proper application of known principles for exploiting a product or a business just as good servicing is a product of knowing what makes a radio percolate. Both require continual study and application.

The average serviceman has been content to concentrate on the technical side of his business. Failing to

see that he also has something to "sell," as important to his business success as technical know-how, he has neglected to give any attention to learning "how" to sell his service and his business.

Before the war most radio service businesses were started as one-man enterprises and whatever growth they experienced came from the owner's favorable contacts with his customers and the coincidence of his shop location. Lacking at least a moderate application of merchandising practices, such shops usually attracted about enough business to keep the owner busy and returned a sporadic income. Unable to lay aside reserves for contingencies, most of these small shop enterprises immediately felt the full impact of every business recession.

The most obvious weakness of the average small business operator is his failure to properly use many of the merchandising tools that are inherent parts of the business or the store location. He pays for many of these facilities in his rent and they could be put to work for him at very little expense. These merchandising "naturals" include the effective use of the entire store front, store interior layout and appearance and the exploitation of his window display space.

In this discussion we are directing our attention primarily to displays—window displays and identification displays. While it is difficult to divorce many of the inter-related factors involved in making an entire store or shop a selling force, the importance of effective window displays in a successful operation cannot be overestimated.

What makes a window display effective?

Roughly speaking, we can say it should accomplish one of two things. First, it must cause a passerby to

HOWARDS RADIO SERVICE



In small towns serving rural areas, location is secondary to exploitation. Striking signs, however, must be strategically placed to make your location known. In Washington, N. J. this large readable sign (shown on opposite page) is visible to all Main Street traffic. It directs traffic to this radio shop located on a side street.

stop for a second look. Next, it should either help impel him to enter the store to buy a particular product or it should make a definite impression on his mind which will cause him to remember that particular store favorably.

You can stop a passerby by exciting his curiosity or stimulating his interest. There are many ways to create that necessary favorable impression. In designing a window display to accomplish these objectives, it is imperative that you consider first of all the peculiarities of your particular business and your business location.

The first factor to be considered is the kind of traffic your display must reach. If your shop location is such that you have good pedestrian traffic, your display should be designed to catch the pedestrian eye. On the other hand you may be in a location where you have to impress a message on the fleeting glance of the passing motorist. In that case your display must carry a fast visual punch. Here your problem is to impress your name and location—particularly your location—on car-borne minds. Tough? Sure it's a tough problem. But it is being solved successfully every day by many alert businessmen.

The three most effective media for stopping the eye for a second look are movement, light and color. Put movement into a window display and the average passerby will instinctively look at the window a second time. This also applies to changing colors or moving lights which visually simulate movement. Scientists say that over 85% of our retained mental impressions come through the eyes. Put a visual punch in your window displays, and you will put thousands of passing eyes to work in your interest.

Motion in a display is undoubtedly the most effective way of stopping a

passerby for a second look. But it must be motion with a purpose. It must be motion to help tell a story or round out a graphic picture. Never use it alone and don't use it too often.

When you change the window in which you have been using motion, follow it with a display that depends on color for its effectiveness. Many pleasing and striking effects can be obtained through the wise use of color. But here also a word of caution. Study the recognized effects of color on human emotions. Be sure that the combination of colors you decide to use will produce the effect you desire.

Lighting, properly designed for use in a given location, will provide the punch a window needs to impress your business on passing traffic. Most

power companies have lighting experts available to help you plan business lighting. Window lighting in itself is important enough to merit special consideration and careful planning. You should avail yourself of the counsel of the lighting expert available through your local company to get the maximum benefit from the illumination of your windows.

Of course, it is obvious that a display designed to sell radio service will be most effective if it has a radio or radio service slant. The entire radio industry is rich in opportunities for graphically portrayed visual stories. The phenomenon of radio is still a vast mystery to the average layman. He knows you can buy a receiver, tune in various stations and hear any number of programs. Beyond that his understanding of how the radio works is apt to be very sketchy.

The average man is constantly seeking information on everyday things which he does not understand or comprehend. He looks for simple explanations—some means of understanding commonplace things without too much mental exertion.

Sometime ago the writer, while in Arkon, Ohio for a weekend, spent an hour on Sunday afternoon observing traffic on South Main Street, the city's main business street. A. Polsky & Co., a large department store, had a display in one window that stopped all pedestrian traffic during that hour. The display that drew this interest was a cross-sectional reproduction of a cow in which was depicted, by mechanical movement, the functional operation of a cow converting fodder into milk. The display told a story by movement and small cards of explanation. It was interesting to observe that pedestrians who stopped to look at this display slowly window-

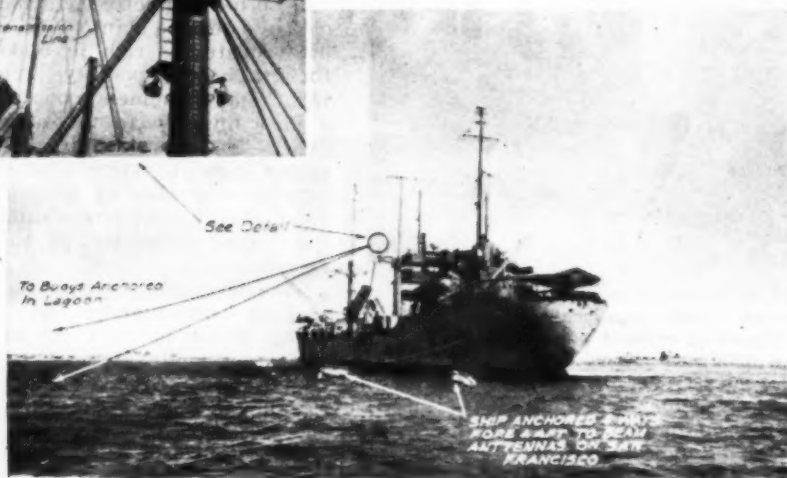
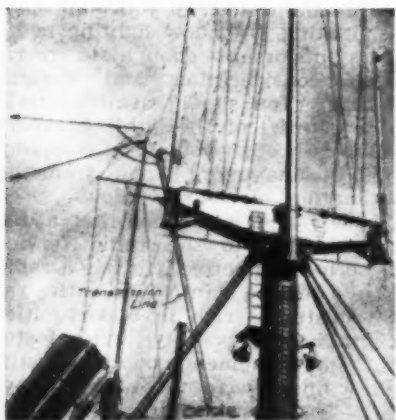
(Continued on page 158)

This type of building lends itself to some type of distinguishing superstructure. This antenna mast identifies the store to both pedestrian and automobile traffic.



The "SPINDLE EYE"

This floating "Radio City" was used to send press dispatches, radiophotos and broadcasts, as well as the August Radio News story, to the mainland.



Because of prevailing winds at Kwajalein Lagoon, the "Spindle Eye," with standard bow anchor would lie on a course of approximately 70 degrees, setting up the maximum lobe of her signal at 340 degrees, or almost at right angles to the desired great circle course on San Francisco. To overcome this, the ship was placed on a course of 143 degrees beaming the maximum lobe on San Francisco at 53 degrees. This was accomplished by a four-way arrangement of anchors fore and aft. In addition to the delta-fed doublet antennas an inverted, untermated V antenna was constructed between the ship's mainmast and special buoys anchored in place in the lagoon, as shown above. This arrangement improved signal strength by 30 per-cent.

By

LT. COL. M. J. LUICHINGER
Ex-W9DWU



As Officer-in-Charge aboard Army Communications Ship, USAT "Spindle Eye," the author added new laurels to a distinguished Army career which began with World War I. He is the holder of the Legion of Merit and Bronze Star. In civilian life Colonel Luichinger was a telephone engineer with the Bell System at Indianapolis, Ind.

COMMUNICATIONS at Operation Crossroads, out in the Mid-Pacific, where nature's mysterious force was being toyed with, played an important role in directing and coordinating a team of some 42,000 people engaged in the world's greatest experiment, the Atomic Explosion.

Many stories have been written of this complicated, joint operation involving forces of the Army, Navy and Air Forces, to say nothing of the many civilian scientists, the pilotless craft of both services flying through the lethal cloud following the blast, the remote operation of hundreds of cameras, gauges and special recording devices and the intricate coordination and precision timing of all functions, none of which have more than casually mentioned the fancy communications involved. Each unit with its own individual function, regardless of the degree of its efficiency, would have been worthless to the over-all objective without reliable communications. Thus reliable communications were the main cog in Operation Crossroads, but, because they are usually accepted as a matter of fact, or taken for granted, their importance is almost never pulled to the surface.

This type of operation involved many classes of communications, such as command and administrative, provid-

ing channels of intelligence between the Forward Command at Bikini and Washington and other associated stateside locations. Then there were the tactical communications, quick conference arrangements between the flagship and widely scattered units throughout the entire test force area. Radio control and operation of drone planes, i.e., pilotless planes taking off, flying a particular mission, returning to and landing at proper bases, electronic control of cameras, observing equipment and television sets within the drone planes, the transmission of ever important meteorological data, remote operation of unattended special observing and recording equipment, including high speed motion picture cameras, and many other functions of this nature were involved which required split second timing.

Then we had the type of communications that kept the American public informed on what was going on 10,000 miles away from home. These facilities provided not only press copy for RADIO NEWS and newspapers of the country and world at large, including the transmission of news pictures known as radiophotos, but also provided a first hand, blow-by-blow description of the entire operation, relayed via the various broadcasting networks. Little does the average per-

son realize what goes on behind the scenes to make it possible for them to read in the local newspapers and sit comfortably in their living room or club and listen to an on-the-spot broadcast or eye witness story of the Atomic Test as it was unfolded out in the Mid-Pacific.

The communications established for the public information phase of this project were without doubt the most fantastic ever set up. Because of the amphibious character of the entire operation all circuits connecting the many islands, planes and ships were, of course, by radio. In all, there were over 100 separate radio channels, ranging in power from 50 watts to 40 kilowatts, engaging some 150 radio transmitters and 300 radio receivers and requiring about 250 cleared frequencies.

As was mentioned previously, this communications plan was the most fantastic ever attempted. Many a headache was experienced during planning and rehearsal stages, making propagation studies, frequencies, reallocations and, in general, working out the bugs before A-Day. Visualizing the requirements while the project was in the planning stages back in Washington was relatively easy. However, going out in the Pacific and constructing the various island installations and equipping the various ships and planes

with the required apparatus, together with the operation and maintenance of this complicated seagoing network, was something else. However, on the predication of, "That which can be conceived can be accomplished," the objective was met. It was a supreme test of the combined efforts of the best the Army and Navy had to offer, not only in equipment and skilled personnel, which incidentally was at low ebb at that time due to our hasty redeployment activities, but also in the most ingenious imagination.

Thus, let's take a quick look at communications at the Crossroads, but let's get down to the purpose of this story, which is to acquaint you with the Army Communications Ship, USAT, "Spindle Eye," and give a brief description of its function in Operation Crossroads.

To begin with, it is only fitting that we review the historic background of the famous Army Communications Ship, "Spindle Eye." To all former G.I.'s with communications service in the Southwest Pacific, it will be interesting to note that the "Spindle Eye" is the successor to the now famous GHQ Communications Ship, "Apache," with call letters WVLC, which not only handled the important public information communications associated with the original Philippines invasion at Leyte, in October of 1944, and subsequent Philippine operations, but also slugged it out on several occasions with Jap air attacks and proudly displayed marks of distinction indicative of her victories.

It was back in June, 1945, in the City Hall at Manila in the office of Major General S. B. Akin, Chief Signal Officer for the Commander in Chief of the Pacific, General of the Army, Douglas MacArthur, that the "Spindle Eye" was conceived. The author had the distinction of participating in planning the communications for what was then scheduled to be our greatest and most sensational operation—the inva-

sion of Japan, which included plans for a press and broadcast communication ship.

After carrying out the engineering phases of the ship and the necessary negotiations with the Transportation Corps for assignment of a vessel to be used for this purpose, I returned to Washington to expedite the procurement and shipment of the necessary special signal equipment which was rushed by air and fast freight from all parts of the country to the Todd Shipyards, Seattle, Washington. I then moved to Seattle to follow up this project where the "Spindle Eye" was already undergoing a first class face lifting under the supervision of the Transportation Corps, converting it from an Army transport to a special Army Communications ship. The ship was completed and sailed ahead of schedule to join the invasion fleet, but by a queer turn of fate the Atomic Bomb, with which the "Spindle Eye" was later to be associated in Operation Crossroads, brought hostilities with Japan to an abrupt conclusion.

The ship continued its course, however, changing its destination to Tokyo Bay, and was used for press and public relations activities by the Army Public Relations people at General Headquarters at Tokyo. She made several cruises to the various islands in the vicinity of Japan, to Korea and the China coast, carrying public relations and press representatives into these sections for stories furnished the American press. In February of this year she was designated to participate in Operation Crossroads and was ordered to proceed to Kwajalein in the Marshall Islands, and placed at the disposal of the Commander of Joint Task Force One.

Broadcast Facilities

The special equipment carried by the ship is as follows:

An RCA 7.5 kw. high frequency voice transmitter, and a Hallicrafters BC610

transmitter. A master, sound treated broadcast studio, with specially constructed soundproof visual panel, providing the master control complete unobstructed observation of the studio.

An auxiliary broadcast studio specially equipped to make recordings with a similar visual panel to facilitate observation from the recording laboratory, which is immediately adjacent thereto.

The recording laboratory is equipped with *Presto* recording and playback tables, also a bank of wire and film recorders, all controlled through an RCA console to provide the necessary mixing and level adjustment, together with necessary associated amplifiers and patching panel to facilitate complete flexibility of this equipment.

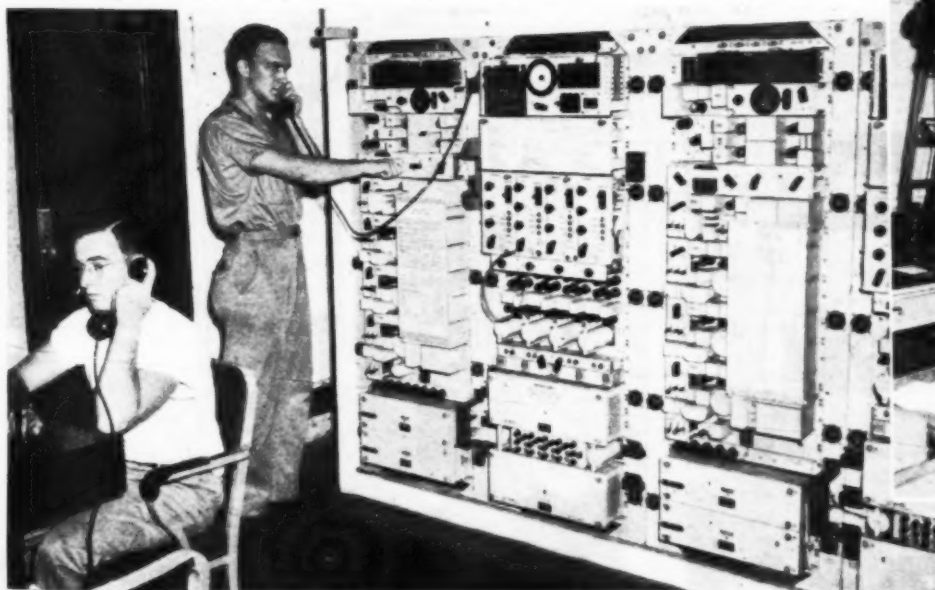
The master control room, immediately adjacent to the master studio, was also equipped with an RCA console and mixing panel, carrying level indicating devices and associated amplifiers and two special *Western Electric* compression amplifiers.

The control room also has complete command of all installations aboard ship, through the master patching panel, designed to facilitate picking up any piece of apparatus in the ship and combining it with any other as required. This patching arrangement also included adjustable attenuation equalizers, which could be applied to remote control circuits when frequency response equalization was required to produce acceptable quality.

A special bank of *Hammilund Super-Pros*, RCA AR-88's and special *National* receivers comprised the receiving equipment in a special monitor room which again is equipped with a patching arrangement to facilitate feeding the desired reception to the master control room.

The radio photo laboratory consisted of two *Acme* transceiver units, together with associated receiving amplifiers, oscillator and level control ap-

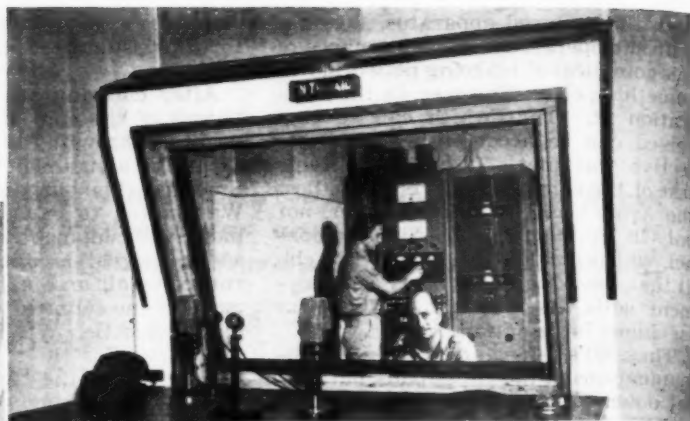
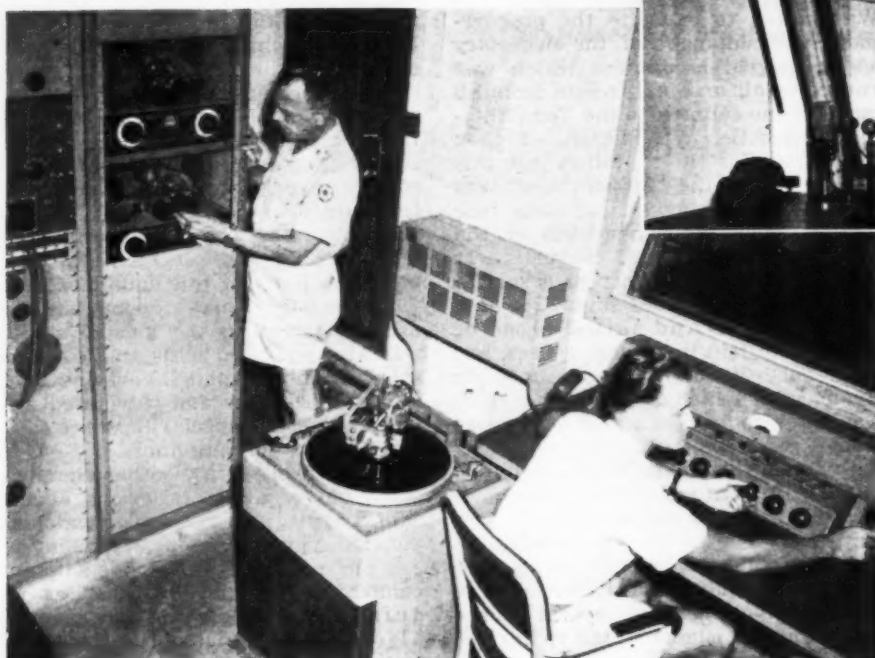
Carrier terminal equipment installed aboard the "Spindle Eye" to facilitate simultaneous transmission of voice and radio teletype.



Complete darkroom facilities are provided in the "Spindle Eye's" photo lab. Colonel Luichinger (left) shows print to Radio News Editor O. Read.

Interior of air-conditioned broadcast studio looking into the control room. Capt. Weaver is at controls as Capt. Burke tunes Hallicrafters S36 monitor receiver.

Studio B and recording laboratory. Captain Diehl rides gain while Col. Luichinger adjusts the tape recorder.



paratus necessary for applying the functions of the *Acme* units to radio channels. Associated with this radiophoto transmitting and receiving equipment is a complete darkroom equipped for all modern photographic operations normally associated with radio news photo functions.

Teletype Facilities

Teletype equipment consisted of three table positions for tape poking operations and two table positions, each equipped with transmitter distributors and typing reperforator units.

The transmitting medium, for long distance purposes, being a 96C, four-channel, 2.5 kw. *Wilcox* transmitter, together with the two *Press Wireless* frequency shift units. For relatively short distance, or what might be termed local transmissions, the famous Signal Corps AN/TRC-1 plus CF 1 and 2 terminal equipment is used, the latter providing a multichannel system of simultaneous telegraph and telephone circuits.

The ship is also equipped with two units of high speed *Boehme* transmitting and receiving equipment, capable

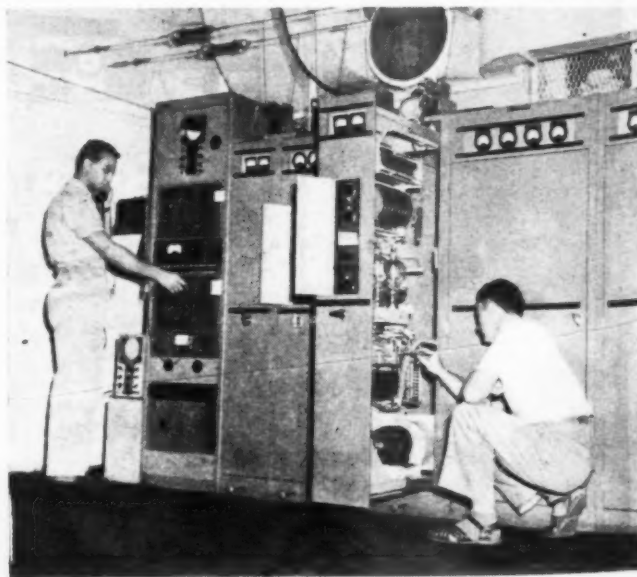
of speeds up to 500 words per minute in the regular telegraphic code. As a matter of explanation, going back to the master control room, it will be remembered we mentioned a master patch panel which facilitated complete flexibility of all equipment on the ship. While we designated the *RCA* and *Hallicrafters* BC610 in the broadcast class and the 96C transmitter in the teletype service, by special patching arrangements these transmitters could be switched from voice to teletype, or vice versa, or placed in dual operation in either, which also includes the use of either in radiophoto transmission service. Another special feature of the ship is a large press conference room, approximately 25 by 100 ft., equipped with 120 typewriter positions for correspondents, a stage, loudspeaking system, dual movie projectors and completely air conditioned. Incidentally, all of the other equipment rooms and studios aboard the ship were completely air conditioned.

The ship was also equipped with a 100-line common battery switchboard, which extended modern telephone service to all component sections of the ship, with trunking positions to extend the ship's telephone service to other
(Continued on page 86)

Captain Burke places a photograph on an *Acme* transceiver in radiophoto room. Picture was transmitted to San Francisco.



Wilcox 2.5 kw., 4-channel transmitter used during Operation Crossroads for the transmission of pictures via radiophoto.



A 1-kilowatt transmitter (center unit) is housed in a cabinet measuring only 42" x 15" x 21". Power supplies are separate, and are illustrated on each side of the transmitter.



Unusual PHONE TRANSMITTER

A new commercially designed modulation system permits cost and size of over-all transmitter to be reduced considerably.

ONE of the bugaboos of high power amateur phone transmitter design has been the necessity for including a heavy duty power supply and modulator. Many methods of simple efficiency modulation have been devised in the past to overcome this difficulty and reduce the over-all transmitter cost but all of these methods were lacking in some essential. Either complicated adjustments were necessary, or large tubes were needed to give reasonable output.

A new series of transmitters have recently been placed on the market by Taylor Western Transmitters of Los Angeles, California. These transmitters use a new high efficiency modulation system which permits the cost of the over-all unit to be reduced considerably. This new transmitter, with an input rating of one kilowatt and a conservative output rating of 700 watts, is only 42" wide, 15" high and 21" deep. Power supplies are separate and may be placed at some distance from the transmitter and connected by means of extension cables.

The tube lineup in the r.f. section is a 6V6 oscillator, a 6V6 doubler, a 3D23 second doubler or buffer and one 4-250A as the power amplifier. The power section consists of a 6V6 speech

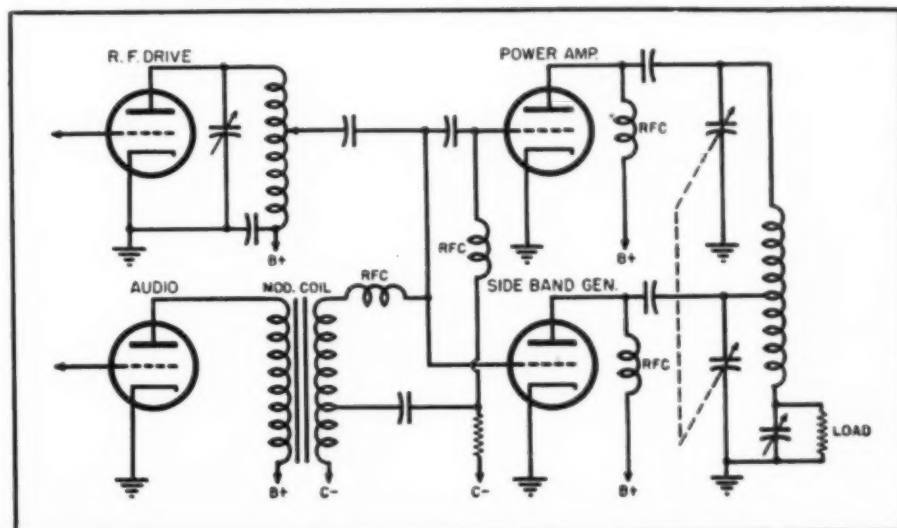
amplifier, an 807 as the second speech amplifier and a second 4-250A as a positive modulator. Band switching operation for five bands is provided.

A simplified schematic of the power amplifier and modulation system is shown in Fig. 1. The operation of the modulation system is as follows:

The modulation system uses two tubes in the output stage, one as power amplifier and one as sideband generator. The input r.f. voltage on the grids of both the power amplifier and sideband generator tubes is obtained from a tap on the plate tank coil of the buffer amplifier through blocking capacitors. The power amplifier is adjusted to operate class "C" at a plate efficiency of from 60 to 70 per-cent while the sideband generator is biased to approximately three to four times class "C." With no modulation, the sideband generator, due to extremely high bias, is almost non-operative since it has practically no plate power input and contributes very little to the transmitter output.

With no modulation the power amplifier tube is furnishing the carrier power and the sideband generator is
(Continued on page 141)

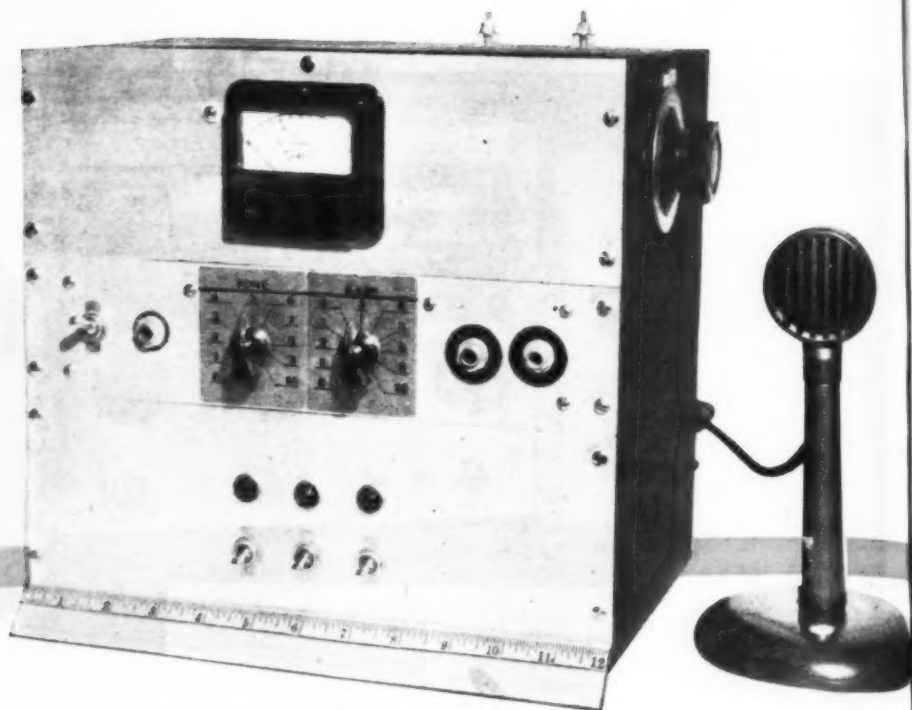
Fig. 1. Simplified diagram of power amplifier and modulation system.



75 Watts in One Cubic Foot

By

W. T. KAWAI, W6MNQ/9



Front view of completed transmitter.

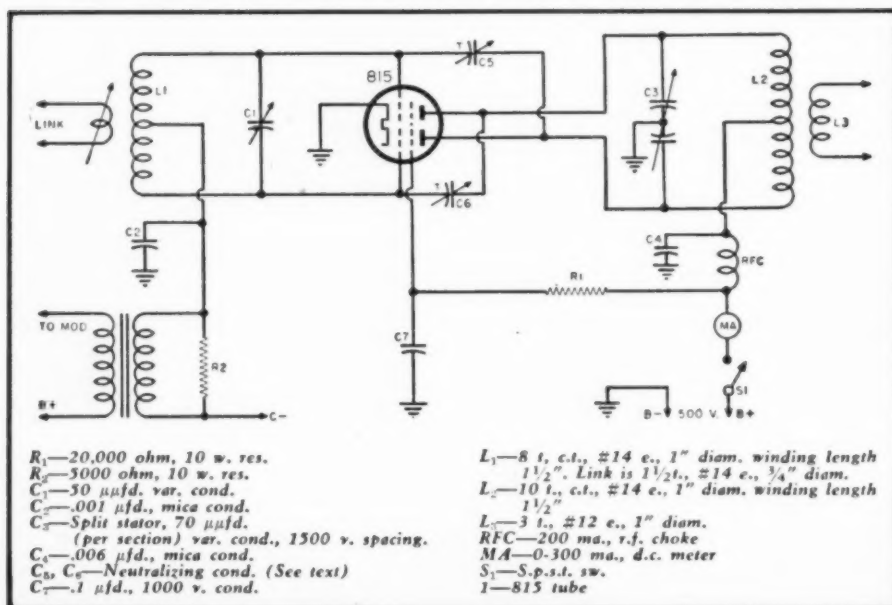
Although compactness is the keynote of this unit, the performance and efficiency compare favorably with many commercially built transmitters.

WITH the termination of the war and the reopening of the amateur bands, many of us now find ourselves so situated that it has become impossible to operate the old "6 foot rack and panel California kw." as we had so hopefully intended when we closed the shack for the duration. The transmitter to be de-

scribed here was designed to fill the needs of those who are now occupying cramped quarters where space for ham rigs is limited, and for those nomadic souls who are confronted with the ever-existent problem of transportation. The over-all size of the transmitter measures slightly less than 1 cubic foot, specifically 13 x 11

x 12 inches, and consists of a 5 x 9½ x 3 inch chassis bolted to the rear of an 8 x 11 x 12 inch cabinet. While compactness is the chief design consideration, the use of standard sized equipment with the high efficiency and ease of operation which go to make a good transmitter have not been sacrificed.

Schematic diagram of final stage of transmitter. This rig has been designed to operate within the tube manufacturer's rating, however operation at an increased voltage of 800 v. on the final (approximately 100-125 watts input) has proven satisfactory. This accounts for the "high-low" switch in power supply.



Circuit Design

The oscillator uses a 6V6 in an e.c.o. circuit with the grid tank operating in the 40 meter band and doubling in the plate circuit to give 20 meter output. This is capacitively coupled to another 6V6 doubler for 10 meter output. After surveying numerous tubes now available, an 815 was selected for the final stage because of its ease in driving and especially because of its small size in relation to its power capabilities. Of course, such things as its ease of neutralization, shielding, etc. were also a part of the consideration. The audio section uses a 6SJ7 speech amplifier and another 6V6 for the modulator. Since the circuit design is considerably influenced by the available space, grid modulation which permits a smaller modulation section and transformer was found to be the most practical. The comparatively low audio power necessary to modulate the final amplifier may be obtained from any number of tubes, however, the 6V6 is used because of its small size. The power supply consists of two sections; one delivers 500

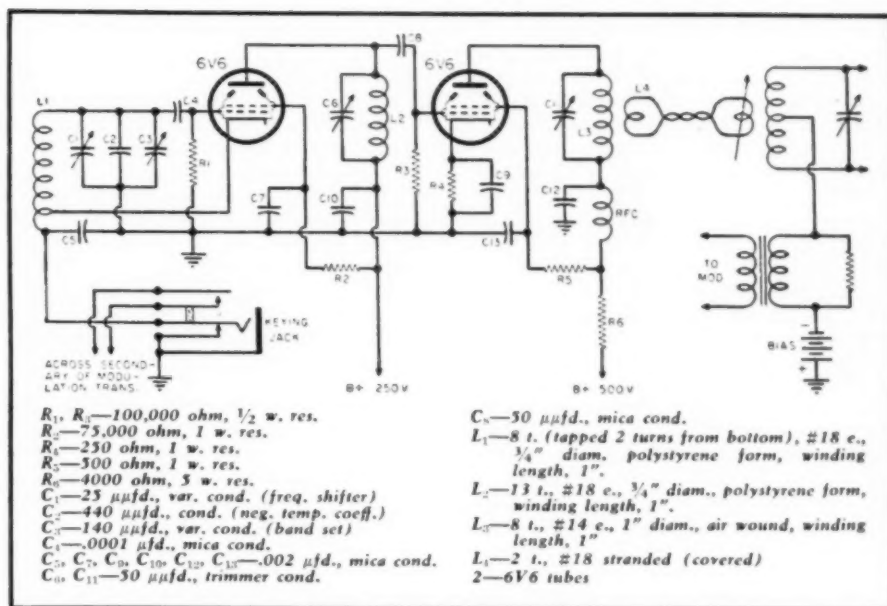
volts and the other 250 volts. The 80 type rectifier is used for the low power supply while two 816's operate in the high power supply.

The power supply is mounted on a 9 x 7 x 2 inch steel chassis, with the high-power transformer in the exact center rear. The large choke CH_1 is mounted to the rear, the filament transformers and small power supply transformer being appropriately spaced around these two units, as shown on page 38. The space to the right and front thus afforded is used for the modulator section and the lower half of the 815 as will be described later. Chokes CH_2 , CH_3 , condensers, C_2 , C_3 and the bleeder resistor R_2 for the small power supply are all mounted below the sub-chassis. In the small chassis bolted to the rear of the cabinet are mounted the three rectifier tubes and the bleeder resistor R_1 . The fuses F_1 , F_2 are of the plug-in type and are mounted on the rear right side of the chassis, next to the "hi-low" switch of transformer T_2 . A "chicken wire" grille of suitable size to enclose this small chassis is used to prevent any contact with the high voltage leads on the rectifier. The high voltage terminal strip is composed of feed-through insulators and is located in the left front position of the power supply chassis. Polystyrene insulators were used, not because of their characteristics, but because of their small size.

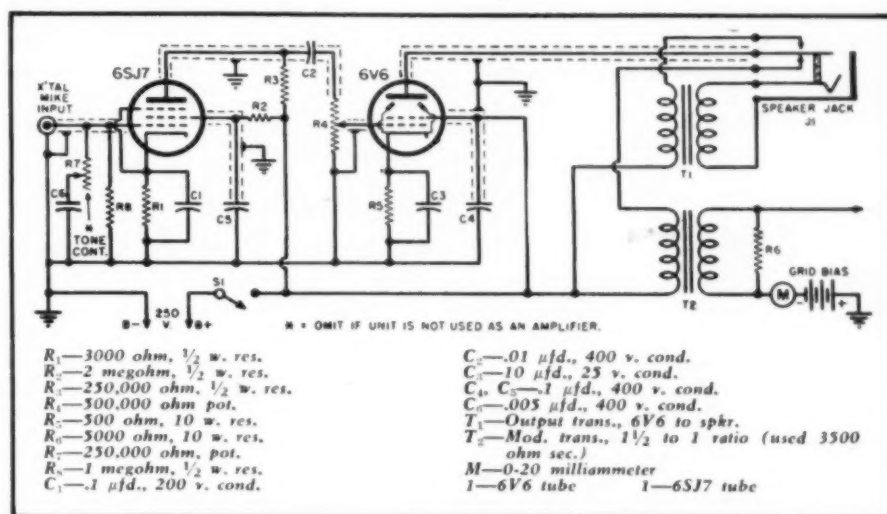
The modulator is constructed in an aluminum cabinet $10\frac{1}{2} \times 3 \times 2\frac{3}{4}$ inches. The circuit is conventional in design, but due to its compactness care must be taken to shield the necessary parts of the circuit to prevent inter-stage coupling and r.f. pickup. This speech section is also used as an audio amplifier to operate the home phono pickup, the switching being done by means of a multi-contact jack which switches the plate lead of the 6V6 modulator to either T_1 or T_2 (audio section). The keying jack, mounted on the panel to the right of the microphone input jack, shorts the secondary of the modulation transformer and keying is accomplished in the grid circuit of the oscillator. To the left of the output jack is mounted the amplifier switch, which removes the plate voltage when the speech unit is not in use. An Astatic model R-3 crystal microphone is used in this transmitter. Obviously, however, one may use any type of microphone by making suitable changes in the input circuit.

The entire r.f. section is built on a sheet of aluminum $10\frac{7}{8} \times 6\frac{3}{4}$ inches. The e.c.o. and the doubler stages are built to occupy a space of $4\frac{1}{2} \times 6$ inches on the left side of the chassis. The remaining space is used in its entirety by the final amplifier. The rear of this aluminum sheet is fastened to the back of the cabinet by means of a $\frac{1}{4}$ inch square brass rod which is tapped for two 6/32 screws. The front is supported by the top of the audio section, the support consisting of rubber grommets.

In considering the oscillator design,



Circuit diagram of e.c.o. and doubler stages of transmitter.

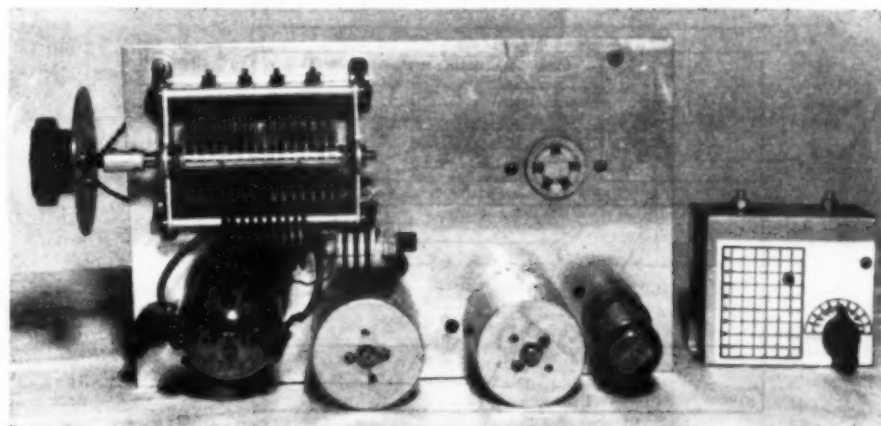


Circuit diagram of the audio section of the 75 watt rig.

the use of an e.c.o. presents many mechanical difficulties in limited space because of the need for ganged condensers and multi-tubes. However, as it is advantageous to be able to shift frequency, especially since the 10 me-

ter band is crowded these days, the e.c.o. is particularly desirable, therefore, a compromise was made. Although the circuit used is standard, it is not designed to cover the whole amateur band as would be expected,

Top view of r.f. section. The e.c.o. is shown to the right in the photograph.



but will allow enough frequency shift on either side of the center so that it becomes possible to shift out from under a strong interfering signal. Thus, it offers the advantage of the e.c.o. without the accompanying elaborate mechanical layout or circuit retuning.

The e.c.o. is built into an aluminum box $4\frac{1}{2} \times 4 \times 2$ inches. The box is divided into two sections thus affording a shield between the grid circuit and the plate tank circuit. At the same time, this allows the tube, which is one of the sources of heat, to be extended partly outside of the box. This minimizes the heat generated in the vicinity of the e.c.o. tank circuit. All wiring within the e.c.o. was done with No. 18 solid hook-up wire for mechanical and electrical stability. The placement of the various components is clearly detailed below. Another mechanical feature of this oscillator, which while not essential may

prove advantageous, is the fact that it is a "plug-in" unit, which allows the substitution of a crystal oscillator if so desired. The plug for the unit was constructed from the lower part of a standard 5-prong coil form.

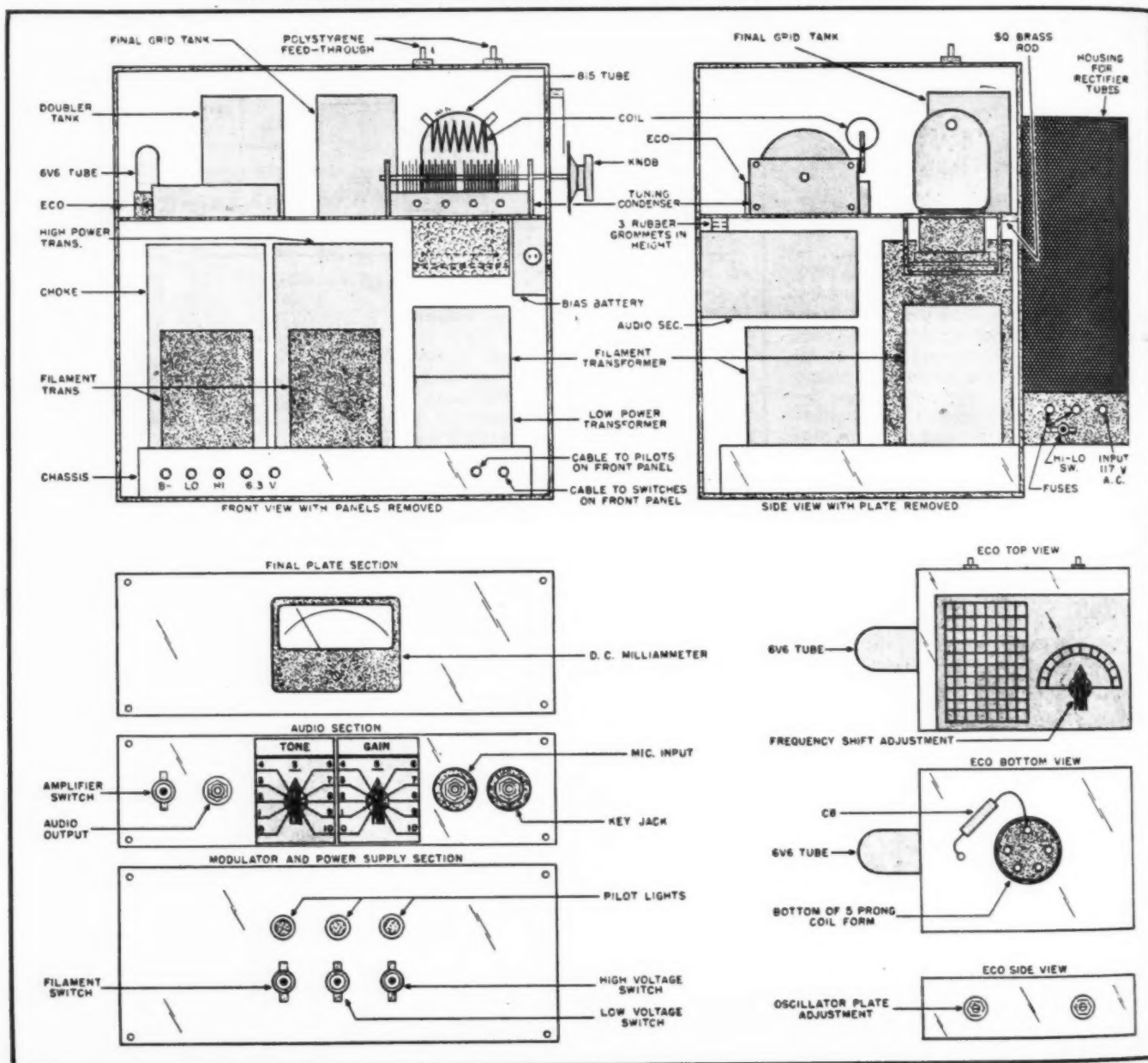
The e.c.o. is capacitively coupled to the 6V6 doubler stage which is straightforward in design. The tank circuit which is enclosed in a 2 inch metal can consists of an air-trim midget condenser and an air wound coil which is connected directly to the condenser leads. No trouble, mechanical or electrical, should be encountered in this stage. One word of caution; all parts for the doubler and final grid tanks should be so arranged in wiring that they do not touch the transformers of the power supply when the chassis is placed in the cabinet.

In the final stage, the grid tank is installed in another 2 inch shield can, its component design being similar to

the doubler tank except that the link is made variable. In the construction of this link unit, the tank coil and the condensers are first connected and mounted in the shield can. A short polystyrene rod is then inserted through a shaft bushing fitted on the shield can. The link, which consists of $1\frac{1}{2}$ turns, slightly smaller in diameter than the tank coil is then slipped onto the polystyrene rod and firmly cemented with some good Duco household cement. This should preferably be left in this position overnight before attempting operation of the link. The other end of the polystyrene rod is slotted with a small saw so that adjustments may be made by using a screwdriver. A shaft lock, taken from an old variable resistor or similar unit may be used to good advantage to keep the polystyrene rod from slipping in too far. The plate tank condenser is mounted lengthwise at the

(Continued on page 139)

Construction details of 75 watt transmitter. Position of all component parts is shown.



Sound Amplification by Air-Stream Modulation

By JORDAN McQUAY

High sound levels may be obtained at low power by the use of this new system of sound reproduction.

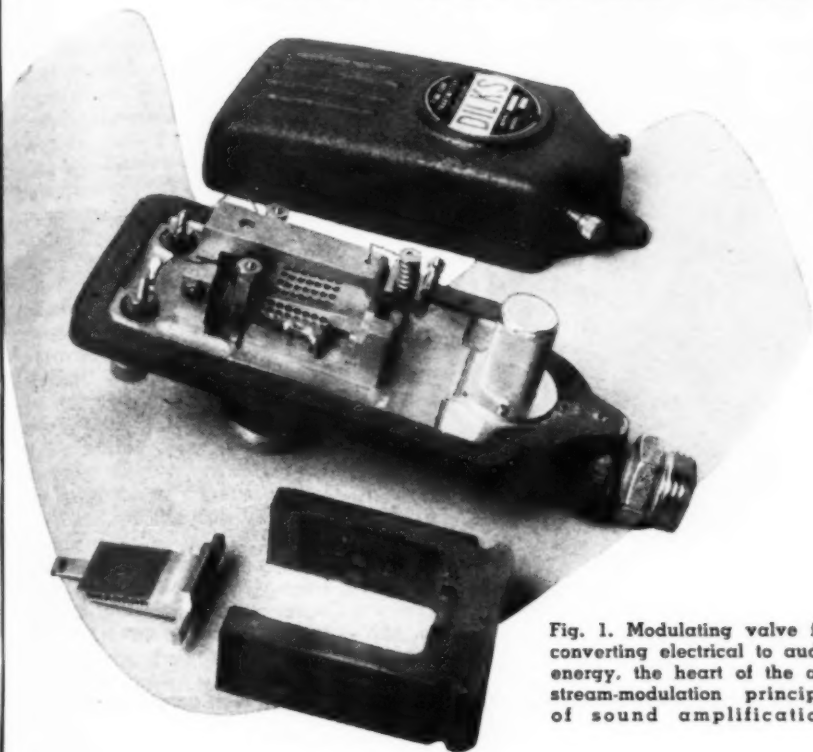


Fig. 1. Modulating valve for converting electrical to audio energy, the heart of the air-stream-modulation principle of sound amplification.

DEVELOPMENT of radar, television, and artillery devices were not the only electronic accomplishments of the war. In addition to such highly glamorous devices developed by our military laboratories and private industry, there was also a need for many technical items not previously considered to be military equipment. One of these prosaic items was public-address equipment—sound amplification.

Such p.a. systems played an important part in winning the war.

They were necessary whenever large groups of men gathered, for orientation, basic training, field training, and maneuvers. Then, too, sound equipment was used in entertaining our troops. Enormous systems were employed to direct propaganda to the enemy, both in Europe and the Pacific.

Sound communication also played tactical rôles in actual invasion, to direct landing troops, and effect liaison with supporting naval vessels.

At the outbreak of war, commercial sound amplification equipment—which American industry was already tooled to produce—was pressed into immediate military and naval service. The various systems were typical of prewar design, their operation based on the principle of electronic amplification followed by the conversion of electrical energy into sound energy by

means of an electromagnetically operated diaphragm or piston.

However, there is one important limitation of all such sound equipment.

To obtain a high output of audio power, particularly out-of-doors, it is necessary to use a large number of loudspeaker horns requiring, in turn, heavy duty multi-stage amplifiers, a source of considerable operating power, and weighty equipment.

Exterior sound installations must provide greater output than compar-

able or similar interior installations, because wind, humidity, and temperature are important attenuating factors.

Almost any velocity of wind, even slight breezes, can distort or greatly attenuate sound after it has left the radiating loudspeaker horns, thus communication may be entirely lost or largely unintelligible.

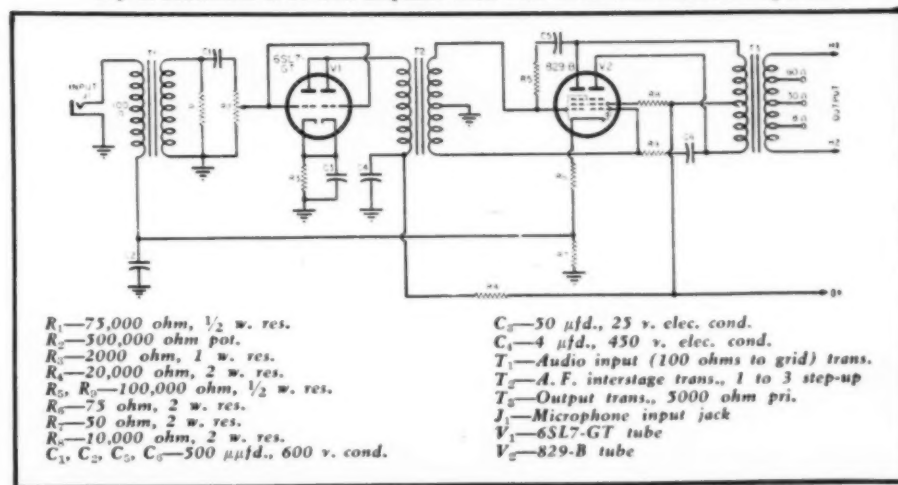
Because of the output requirements of such public-address systems, and because of the military necessity of portability and light weight, a different type of sound amplification became an immediate war requirement.

The problem was attacked by the Signal Corps Engineering Laboratories working with sound engineers of *Dilks, Incorporated*. Exhaustive experimentation eventually led to the development of an entirely different method of sound amplification; the *modulated air stream*.

The new equipment has a remarkably low weight-to-output ratio. This is demonstrated by comparison with a typical 300-watt amplifying system. The older equipment weighs about 750 pounds; the air-stream-modulation system weighs only about 80 pounds.

(Continued on page 137)

Fig. 2. Schematic of 15-watt amplifier used with air-stream modulated system.



Practical RADIO COURSE

By
ALFRED A. GHIRARDI

THE question of tube noise is of great importance in the design of the mixer portion of a frequency converter, especially when the mixer is the first tube in the receiver (no r.f. amplifier stage employed ahead of it).

Types of Receiver Noises

There are really two main types of noises created within a receiver, (1) *thermal agitation* and (2) *tube noises*.

The first occurs in impedances, but is most apparent in those linked to the control-grid of the first tube in a receiver, owing to the large amplification following. We cannot do much about this source of noise.

Tube noise may be caused by several effects occurring in vacuum tubes due to the inherent electronic nature of their operation.

Sources of Tube Noise

One important source of tube noise, known as the *shot effect*,¹ arises from the fact that the currents in the tube consist of the movement of individual electrons rather than the flow of a continuous fluid. Since the electrons are discrete particles emitted from the cathode in a random way, any current resulting from such emission has a random variation that is termed "noise," since it results in a noise of some kind in the receiver output. This noise effect is distributed fairly evenly over the frequency spectrum. The noise for a given current is *maximum* when the plate is absorbing all the electrons that are liberated from the cathode. If the plate does not receive all the electrons emitted by the cathode, as happens when there is a very copious emission causing the current (electron flow) to be limited by the space-charge repulsion between electrons, then the noise is greatly reduced because of a cushioning effect exerted upon the variations in rate of emission by the great number of electrons emitted. Consequently, the noise is



Feature of new General Electric phonograph is the instantly retractable jeweled stylus. This stylus will not scratch or damage records if the tone arm is dropped.

Part 50. Covering tube noise in superheterodyne frequency converters and the proper selection of commercial types of mixer and converter tubes.

reduced in tubes in which the current to the plate is space-charge-limited.

Another source of tube noise arises from variations in the secondary emission taking place within the tube, and from a random variation of the division of current between the electrodes in multi-electrode tubes.

Equivalent Grid Resistance

Tube noise is conveniently expressed in terms of an *equivalent grid resistance*, R_{eq} . This is the value of resistance that, if connected between the signal control grid and cathode of the tube would produce a thermal agitation noise that would equal the noise actually produced by the tube itself, approximately. Thus it may be looked upon as an *equivalent* noise-producing resistance.

Noise Produced by Various Types of Amplifier Tubes

The noise energy in screen-grid, pentode and beam type tubes is *higher* than in triodes with similar characteristics because there is an added component of noise due to the random division of current between the screen

and plate in these more complicated form of tubes. For example, the noise energy from a pentode is about three to five times as great as that from a triode producing equivalent amplification.

Tube Noise in Frequency Converters

The mixer portion of a frequency-converter stage produces noise voltages in its output as a result mainly of random fluctuations in the space current of the tube and random variations in the way the space current divides between the plate and the other *positive* electrodes in the tube.

Experimental evidence indicates¹ that the major portion of the noise that is found in the output of mixers and converters employing *outer-grid* oscillator injection (tube types 6L7, 6J8, etc.) is due primarily to current-distribution fluctuations. The oscillator voltage changes the current distribution from plate to screen so that the mixer noise is given by the average of the distribution fluctuations over each oscillator cycle.

The major portion of the noise that is found in the output of mixers and converters employing *inner-grid* oscillator injection (tube types 6A8, 6SA7, 6K8, etc.) is primarily due to

¹ W. A. Harris, "Fluctuations in Vacuum Tube Amplifiers and Input Systems," *RCA Review*, Vol. 5, pg. 505, April 1941; Vol. 6, pg. 114, July 1941.

current-distribution fluctuations, but is complicated by the presence of the virtual cathode ahead of the signal grid.

Comparison of Noise Produced by Various Types of Mixer and Converter Tubes

Triode or pentode mixers and converters, in which both the signal and oscillator voltages are impressed on the same control grid (single-grid input), produce the *least* noise (*highest* signal-to-noise ratio) of any of the commonly-used types of mixers or converters (see Table 1). The reason for this has been made clear by studies of tube noise.¹ Tube noise is the combined result of shot noise in the cathode current (which is damped by space charge to a low value) and additional fluctuations in the plate current caused by random variations in primary current distribution between the various positive electrodes. Thus, in general, those tubes having the smallest current going to positive electrodes other than the plate have the lowest noise. Since the tetrode or pentode mixer or converter tube has a primary screen current that is only 25 per-cent (or less) of the total current, it is inherently lower in noise than the more complex modulators in which the current to positive electrodes other than the plate usually exceeds 60 per-cent of the total current. The triode, of course, has the lowest noise assuming an equivalent tube structure. The conversion transconductance of triode, tetrode, or pentode mixers is usually higher than that of multi-electrode tubes using a similar cathode and first-grid (G1) structure. That this is so is again largely due to the lower value of wasted current to other electrodes.

It is unfortunate that the design of pentagrid converter tubes makes them inherently more noisy than r.f. pentodes—the noise produced by them being about four times that produced in a super-control r.f. amplifier tube.

The special mixer and converter tubes used in broadcast receivers are distinctly inferior from the point of view of noise level. It is interesting to note that a high ratio of transconductance to space current reduces the noise level, so that the special pentodes designed for television receiver service (types 1852, 1853, etc.) have much lower noise output than ordinary tubes.

Advantage of Using R.F. Amplifier Stage Ahead of Converter

Generally speaking, the equivalent grid resistance representing the noise of a mixer or converter tube is always greater (2 to 4 times) than the corresponding equivalent resistance representing the noise generated in the same tube functioning as an ordinary

¹ E. W. Herold, "Superhet Converter System Considerations in Television Receivers," *RCA Review*, Vol. 4, pg. 324, January 1940.

² If a tuned type of r.f. amplifier stage is employed, additional advantages involving freedom from certain types of spurious responses, etc., are also obtained. See Alfred A. Ghirardi, *Practical Radio Course*, Parts 27, 28, 29, 30; *RADIO NEWS*, October 1944, Nov. 1944, Dec. 1944, Jan. 1945.

Desirable Characteristics	Osc. and Signal Voltages on No. 1 Grid (Single-grid input)		Osc. Voltages on No. 1 Grid, Signal on No. 3 Grid (Inner-grid injection)	Osc. Voltages on No. 3 Grid, Signal on No. 1 Grid (Outer-grid injection)	
	Triode	Pentode	Hexode or Heptode	Pentode	Hexode or Heptode
High conversion transconductance.....	Good	Good	Fair	Fair	Fair
High plate resistance.....	Poor	Good	Good	Poor	Good
High signal-to-noise ratio....	Good	Good	Poor	Poor	Poor
Low oscillator-signal circuit interaction and radiation..	Poor	Poor	Fair	Good	Good
Low input conductance at high frequencies.....	Poor	Fair	Good	Poor	Poor ²
Low signal-grid current at high frequencies.....	Good	Good	Fair	Poor	Poor ²
Low cost of complete converter system.....	Good	Fair	Good	Fair	Poor

¹Due to feedback; may be increased to "Fair" by proper circuit design.

²May be increased to "Fair" by special constructions.

Table 1. Comparative appraisal of inherent operating characteristics resulting for each of the three general modes of frequency converter tube operation.

Class "A" amplifier. For example, an r.f. pentode tube used as an autodyne frequency converter will produce about *twice* as much noise as when used as an r.f. amplifier. Accordingly, when the internal impedance of the signal voltage source applied to the converter input does not greatly exceed the equivalent noise resistance of the mixer or converter tube, there is a decided advantage in employing a stage of r.f. amplification ahead of the frequency converter. In this way the main source of noise will be thermal agitation in the input circuit, instead of the large tube noise. The only practical case when r.f. amplification will not reduce the noise level appreciably is when triode or pentode plate-rectifier converters are used. In such arrangements, practical values of internal impedance of the signal voltage source applied to the converter tube can be made considerably greater than the equivalent noise resistance, except possibly in television systems.²

The conventional method of reducing the tube noise in any given superheterodyne receiver design in which

the type of mixer or converter tube to be used has already been settled upon because of other important desirable operating characteristics it may have (see Table 2), is to employ a stage of r.f. amplification having sizeable gain, ahead of the converter.³ When the r.f. amplifier stage is used, the signal amplitude fed to the signal grid of the mixer or converter tube is large compared to the converter noise. Consequently, this *increases* the signal-to-noise ratio to the extent that the converter noise usually becomes negligible.

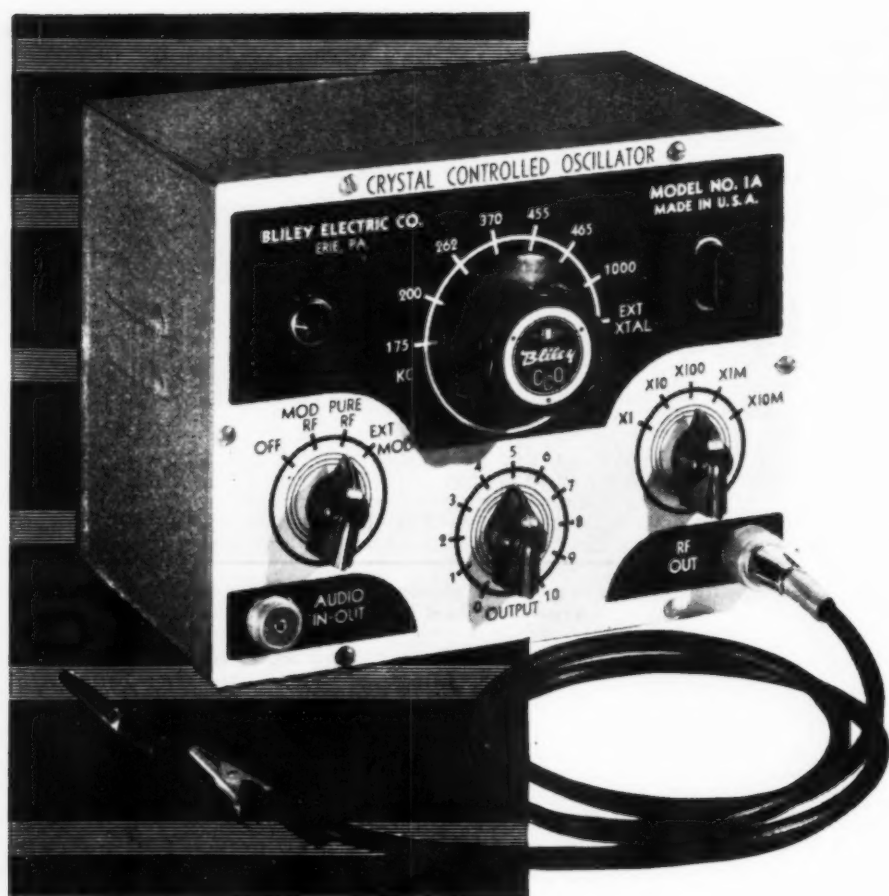
Importance of Frequency-Converter Noise in Receiver Design

Converter noise often is an important consideration, particularly in u.h.f. receivers, short-wave receivers for distant-signal reception, and in loop-operated receivers of small size where the signal voltages delivered by the antenna circuit are not large and an r.f. stage often cannot be used because space is at a premium and the receiver cost must be reduced to a

(Continued on page 142)

Table 2. Operating characteristics of various popular mixer and converter tubes.

Form of Tube	Type Number	Used As	Conversion Transconductance (μmhos)	A.C. Plate Resistance (Ohms)	Calculated Conversion Gain	Space-charge Coupling Present	Osc.-Frequency Stabilizer (As Converter)	
							Frequency Shift Due to Supply Voltage Variations	Frequency Shift Due to A.V.C. Voltage Variations
Simple Pentagrid Converter.....	6A8	Converter	550	360,000	71	Yes	Poor	Poor
Simple Pentagrid Converter.....	1A7G	Converter	250	600,000	35	Yes	Poor	Poor
Modified Pentagrid Converter.....	6SA7	Converter	450	1,000,000	75	Yes	Fair	Good
Modified Pentagrid Converter.....	1R5	Converter	300	600,000	45	Yes	Fair	Fair
Pentagrid Mixer.....	6L7	Mixer	375	1,000,000	62	No	.....	Fair
Triode-Heptode Converter.....	6J8G	Converter	290	2,500,000	54	No	Good	Good
Triode-Hexode Converter.....	6K8	Converter	350	600,000	52	Yes	Fair	Good
*Optimum values								



Panel view of generator. A spare crystal socket is provided for addition of extra crystals operating between 150-700 kc.

Crystal Controlled Signal Generator

A SIGNAL generator is one of the most important instruments used in servicing radio receivers. It is on this instrument that the serviceman depends for putting the final touch to his work by aligning the i.f. and r.f. stages properly, and the accuracy with which he can do this depends directly on the accuracy of his signal generator. With the increasing demand for greater precision in the radio service field there is need for a more stable frequency source; one which will maintain its calibration exactly for a long period of time.

The result of aligning the i.f. stages at a frequency above or below that specified by the manufacturer is graphically shown in Fig. 1. Only when the i.f. channel is correct will the receiver track exactly with its dial calibration. Even though the 600 and 1400 kc. check points are correctly set with their respective padders, the dial

calibration will be off over the rest of its range. Also, tracking will be poor and receiver sensitivity will vary over different portions of the dial. From this it can be seen why it is important to have an accurate source of signal for i.f. alignment. Of equal importance is the accuracy of the r.f. signal for spotting the 600 kc. and 1400 kc. points as well as frequencies between these two.

There are many fine examples of continuously variable frequency oscillators on the market today but their accuracy is subject to the limitations of the self excited circuits. These limitations include the effects of temperature, humidity, vibration, the ageing of tubes and components and variations in dial calibration.

Quartz crystals provide the most stable method of frequency control known today. They are employed in practically every radio transmitter in the world and their use is being ex-

Instant selection of any one of seven channels may be had by simply rotating a switch.

By

HERBERT G. JOHNSON

Radio Eng., Bliley Electric Co.

panded to the control of fixed reception channels in receivers. These tiny wafers of quartz which exhibit a piezoelectric character will maintain their frequency calibration indefinitely. This method of frequency control is featured in a signal generator which was recently announced by the *Bliley Electric Co.*, of Erie, Penna. A set of seven frequencies have been selected for their usefulness in the alignment of i.f. and r.f. stages. An added advantage to the stability secured by these crystals is the instant selection of a desired channel by the simple flip of a switch. Not only does this result in considerable time saving, but also the possibility of error in dial setting is eliminated. Each switch position produces a single frequency channel which will remain accurate indefinitely.

In choosing the channels which are provided by this oscillator it was necessary to conduct a survey of the intermediate frequencies used by various manufacturers, in standard broadcast receivers. The survey included almost 7000 types made by twenty leading manufacturers since 1930, and the chart of Table 1 shows the result. Channels 455-456 and 260-262 are scored together because of the proximity of their frequencies. For the sake of economy, and because the i.f. channels with less than 2 per-cent representation are for the most part used in old radios which are rapidly being decommissioned, the first five frequencies were selected for use in the oscillator. They make up 91% of the frequencies used in the nearly 7000 receiver types covered by the survey. The results show that by excluding the odd frequencies used on sets made before 1936, the first five channels of Table 1 make up 95.2% of the total. Thus, the serviceman can expect to handle at least 95% of his i.f. alignment with crystal controlled accuracy.

In addition to the five channels provided for i.f. alignment, there are two for r.f. alignment. These are crystal controlled at 200 and 1000 kc. The 200 kc. is of particular usefulness in the broadcast band since it provides strong harmonics at 600, 800, 1000, 1200, 1400 and 1600 kc. The 600 and 1400 kc. harmonics may be used for low and high frequency padder adjustments. The 1000 kc. channel serves as a check point in the center of the broadcast band in cases where alignment is more than 100 kc. off calibration. Once the 1000 kc. point is located the 200 kc. points can be followed up and down the dial. The 1000 kc. channel is also

for use in alignment of short-wave bands. Its harmonics can be used up to 20,000 kc. on the average receiver, and up to 50,000 kc. on the more sensitive communications type of receiver.

An external socket on the front panel provides for use of extra crystals with frequencies between 150 and 700 kc. With two such crystals the oscillator may be used in the alignment of FM receivers. For example, a 5350 kc. crystal will produce a harmonic at 10,700 kc. for i.f. alignment and a 5000 kc. crystal will produce harmonics every 5 mc. in the FM band for r.f. alignment.

The crystals employed in this instrument are representative of the latest design trends in the low frequency range. The six units below 1000 kc. contain low temperature coefficient quartz plates on which silver electrodes have been deposited. Each crystal is rigidly supported by wires that have been soldered directly to this plating. This type of assembly insures maximum stability. The 1000 kc. crystal is also a low temperature coefficient quartz plate and is mounted conventionally in a free air gap assembly which restrains crystal movement and restricts any frequency shift to a few cycles. Both types will absorb far more punishment than could conceivably be encountered in an instrument of this kind. The crystals can be seen in the rear view photograph with the retaining disc removed. The low frequency units are in the aluminum cans which encircle the 1000 kc. crystal in the rectangular holder.

Another feature of the crystal controlled oscillator is the high output which is available. It is sufficient to practically eliminate the need for direct coupling to the receiver. In most cases it is only necessary to lay the output lead from the oscillator near the receiver and increase the output until the signal appears on the meter, or in the speaker, whichever method is used. There may be some instances where the receiver is so far out of alignment that a great deal of input is necessary. In this case the leads are clipped to the antenna post or to tube grids in the conventional manner.

The oscillator output is controlled by a five step attenuator switch and a vernier control. Maximum output on step X1 is approximately 1500 microvolts and each successive step multiplies by ten, resulting in approximately 15 volts output on step X10M. With the attenuator and vernier both set at minimum, the r.f. voltage present across the output clips is about 10 microvolts which is sufficiently low for most applications. For special cases decreasing the coupling will reduce this further.

It is very important to caution the user against coupling the oscillator directly to an antenna since its output is great enough to cause considerable interference. Some servicemen will find it convenient to attach the output to a short wire running along the

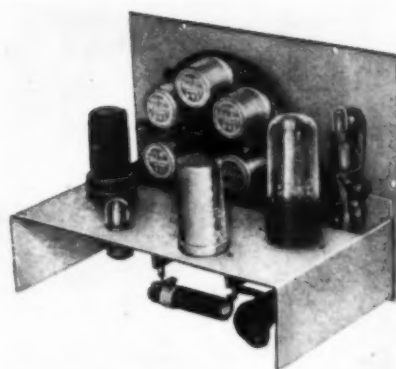
I. F. CHANNEL	PERCENT OF TOTAL
455-456	58.2
465	14.0
175	10.6
260-262	5.7
370	2.58
460	1.72
470	1.47
450	.94
445	.78
480	.65
181.5	.63
485	.53
252.5	.52
ALL OTHER CHANNELS	LESS THAN .5

Table 1. Survey shows that 95.2 per-cent of total receivers in use today employ one of five different i.f. frequencies.

bench and use its radiation alone as a coupling medium to the receivers, but such a wire must not be more than a few feet long.

A four position modulation control is provided on this oscillator in order to give maximum flexibility. The positions are: "OFF," "MOD. RF," "PURE RF," and "EXT. MOD." With the control at "MOD. RF" an internal audio oscillator modulates the r.f. output with a 400 cycle tone. On the six low frequency channels the internal tone modulates the output approx-

(Continued on page 164)



Rear view of the crystal controlled signal generator. Crystal harmonics may be used for aligning short-wave and FM receivers.

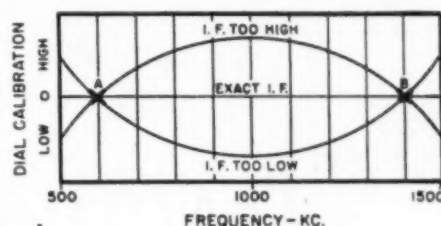
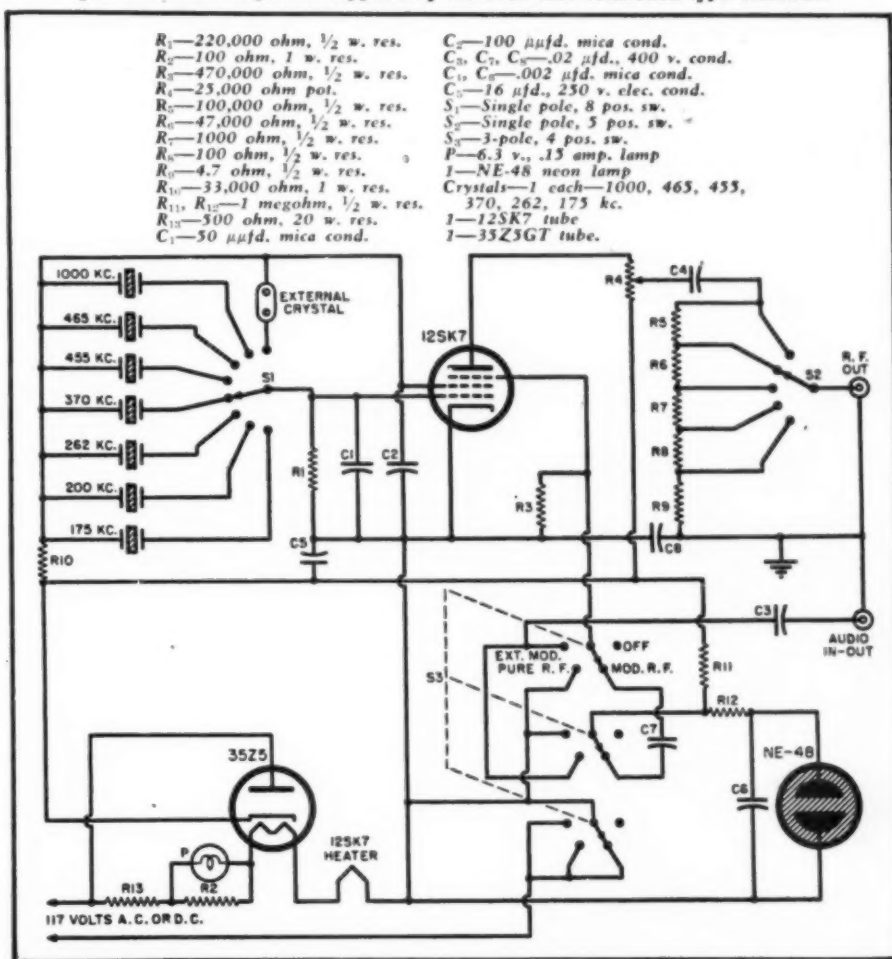
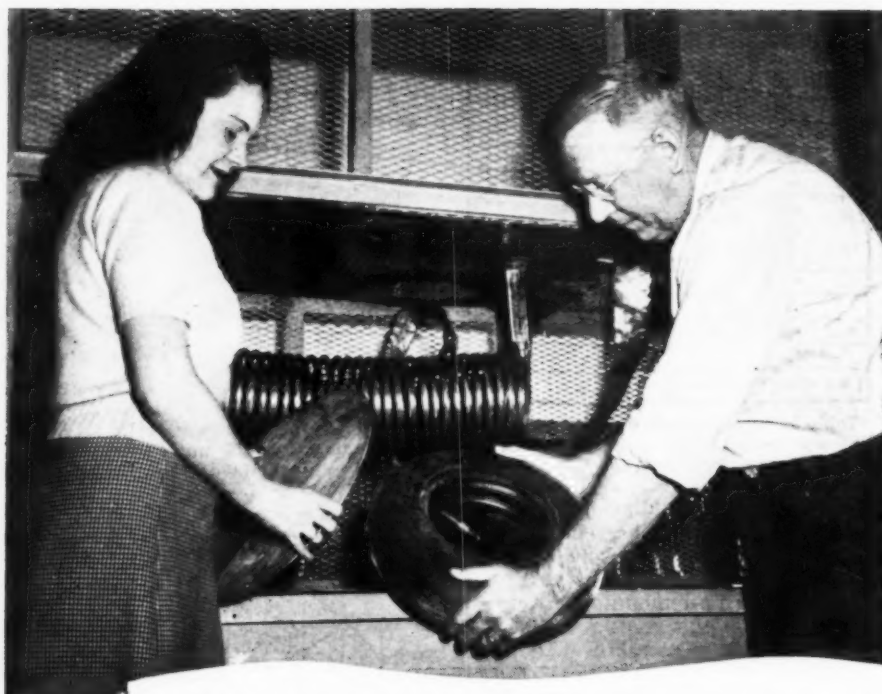


Fig. 1. Graph illustrates the effect on dial calibration if i.f. frequency alignment is above or below that specified by the radio receiver manufacturer.

Fig. 2. Circuit diagram of crystal controlled signal generator. An internal 400 cycle modulation signal is supplied by the neon tube relaxation type oscillator.





Small tire forms are electronically preheated in this unit prior to forming in steam-heated molds. The combined steam and electronic process has cut production time drastically in this application.

Electronics has been hailed by the rubber industry as a means of cutting the costs while improving the quality.

ELECTRONIC DEVELOPMENTS

in the Rubber Industry

By

WILLIAM G. ROUTH

MIRACLES sometimes happen! At least that is the opinion of the rubber industry after viewing with open skepticism the efforts of the Electronic Laboratories of the *Firestone Tire and Rubber Company* and the *B. F. Goodrich Company* of Akron, Ohio. According to announcements from these sources, electronic vulcanizing has been wholeheartedly

Engineer checks one of the rectifier tubes used in the electronic vulcanizer unit.



adopted as an important factor in the production of rubber articles.

With this support "Heatronics" has now come out of the laboratory and into the production of such articles as tires, *Foamex*, brake lining and plastics. Increased quality and greater consumer acceptance will be among the end products, while savings in production time will, in some instances, run as high as ten to one.

The background for this present development goes back to certain discoveries made in 1935 by two Frenchmen, Rene Dufour and Henri Auguste Leduc. These scientists, with background experience in medical diathermy as applied to the high frequency heating of the human body, discovered in the course of their experiments that the application of high frequency dielectric fields to compounds of rubber would produce curing or vulcanization quicker and more uniformly than was possible by the application of heat alone.

The work of these scientists was undertaken with the backing of the Sorbonne University, The French Academy of Science and the French Government. This method of heat treating was first demonstrated in 1937 at the Paris Exposition.

Since that date various experiments have been underway with the thought

of improving the process for industrial application. One such experiment has been successfully concluded at the *Firestone Tire and Rubber Company* and has resulted in the installation of equipment for the curing of *Foamex* at the Fall River, Massachusetts plant of the company. *Foamex*, the company's trade name for foamed rubber latex, is used in mattresses, automobile upholstery and similar applications.

This unit has been installed on three levels. The power and oscillator cabinets are mounted on the top level, about ten feet above the floor. The operating control unit, located at a lower level, overlooks the work which is handled at floor level. Conveyors deliver the material alternately to each of two trays which are so situated that one may be filled with foamed latex while the material in the other tray is being cured.

The contents of each tray, when finished, is tipped out onto a conveyor on which it is washed and given a brief final high frequency burst of power for preheating. The conveyor then carries the preheated rubber into a drying oven where, during its hour long journey, the product is dried.

This method of producing *Foamex* is capable of turning out a cured unit as large as a mattress of double bed size in four minutes of electronic heating

plus drying time (after washing) of one hour. These figures are in comparison with the former production times of thirty minutes in a steam mold and from 16 to 18 hours in a hot air oven. In addition, the new product achieves several points of superiority over that cured by the older method, i.e., the quick treatment "fixing" of the air bubbles before their dispersion and the retention of millions of tiny, uniform air pockets throughout the material.

This mass production unit is powered by a 125 kw. standard model Westinghouse high frequency oscillator with suitable control units for manual or automatic operation. The unit is designed to operate on frequencies assigned by the Federal Communications Commission, although proper shielding has been provided in order to insure a minimum of radiation. This unit was designed by Firestone engineers in co-operation with Westinghouse Electric Corporation of Baltimore.

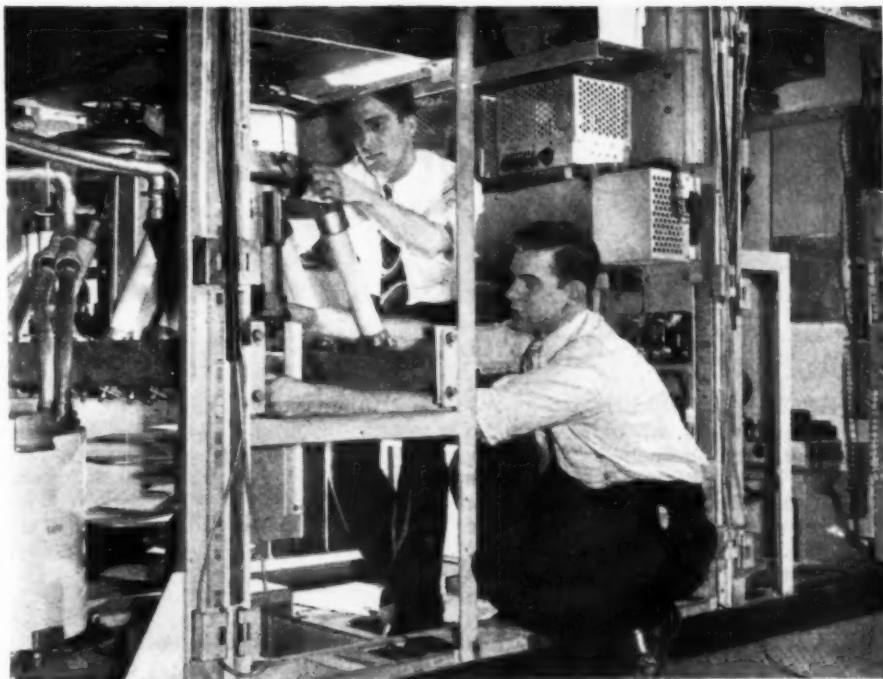
Until recently, steam heated molds were used exclusively by the rubber industry to convert the raw compound into the finished product. However, steam has certain disadvantages, such as the length of time required for the heat to penetrate the material in order for the necessary chemical action to take place.

Electronic vulcanization has decided advantages over steam in the curing of rubber compounds in that the so-called "molecular friction" set up by the dielectric field used in this process creates molecular activation and heat instantly throughout the object under treatment. After a brief period, the flow of heat is from the core out, regardless of the thickness of the object under treatment.

There are other advantages to this method such as better quality, due, apparently, to the extremely rapid vibration imparted to the sulfur and the molecules of rubber by the dielectric field. The frequencies used in this process range from 1 to 100 mc. This characteristic result of dielectric heating suggests uses in other fields where compounding may be aided by molecular vibration.

Some results achieved by this new process are impressive when compared to those produced by previous methods. Large hard rubber industrial wheels that formerly took five hours to cure with steam now require two minutes of electronic treatment, plus eighteen minutes in a shaping mold. Similarly, brake blocks which required seven hours to process by steam now are cured in 48 minutes.

The manner in which electric force is made to penetrate materials such as rubber compounds, resins, plastics, etc. might be described, in general, as follows. Many such substances ordinarily considered nonconductors, especially insofar as direct current or alternating current of a low frequency are concerned, may be made to conduct if sufficient potential is applied. However, the higher the frequency, the



Two Firestone engineers install one of the power tubes used in the electronic vulcanizing unit at the company's Fall River plant. Two tubes of this type provide 125,000 watts of electrical energy for production of Foamex mattresses.

lower the potential required to force a given amount of energy through the dielectric. In general, then, the higher the applied frequency, the lower the voltage required to produce a given heat in the dielectric.

Not all substances can be as efficiently treated by high frequency as rubber compounds, as the nature of the product influences the results obtained by the heating process. The factors governing dielectric heating efficiency in any given material are its dielec-

tric constant and its power factor. The higher these values run, the more efficiently the substance may be heated. For instance, air which is considered to be the most basic dielectric has a constant of 1, a power factor of zero and is not appreciably affected by dielectric heating. Pure phenol, on the other hand, with a constant of 5 and a power factor of 1 is an excellent subject for treatment. Rubber compounds, depending on the proportion

(Continued on page 72)

Heat-treated tank tracks are put into this machine and pressed into their metal base. This unit applies steam curing which follows electronic process.





By CARL COLEMAN

UNITED Fruit which is a company always of interest to marine radio men recently launched the new Heredia, second of three of its class at Newport News, Va., The Parismina was put overboard a short time ago and the Metapan is to be completed shortly—the ships are all reefer jobs of a special design rated at close to 20 knots, 12 passengers with 320,000 cubic feet of cargo space of 12,890 tons and are about 455 feet in length. Also recently launched was the Santo Cerro, fourth in a group of nine being built for the company by the Bethlehem Sparrows Point Shipyard at Baltimore, the Santo Cerro, one of the "Yaque" class vessels has a rated speed of sixteen knots with reefer cargo capacity of 197,000 cubic feet, 12 passengers, 4600 tons and 385 feet long.

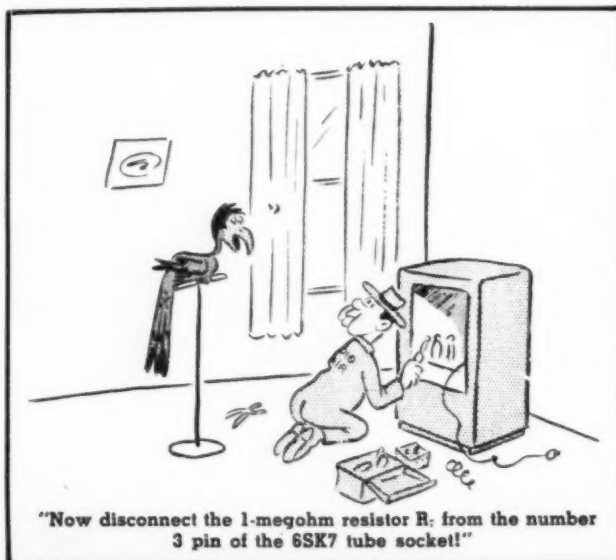
ALCOA recently announced that the George Washington, temporarily placed on the Bermuda run will be maintained on the schedule, through the end of the year due to the heavy demand for shipboard passenger travel to the island.

ALCOA, another line of interest to marine radiomen because of its large number of ships have three vessels recently launched on the West Coast at Portland, Oregon. The vessels are of the combined passenger-cargo type destined to serve the Caribbean out of New York and New Orleans. Each has a displacement of 14,870 tons and although 98 berths will be available on each ship the average per trip is expected to be about 60 passengers. The three, the Alcoa Cavalier, Alcoa Clipper and Alcoa Corsair were originally started by the U. S. Maritime Commission as Victory ships but were purchased shortly after they were started by Alcoa and completely redesigned. Company officials pointed out that in using a con-

siderable amount of aluminum a great saving in weight and also freedom from corrosion by sea-water is obtained . . . the two upper decks of the superstructure and the stack will be of aluminum which is also used in lifeboats, davits, hatch covers, air ports, ladders and windows . . . the ships have been constructed to achieve the maximum in safety, the hull has been sub-divided into seven compartments to insure the greatest possible stability under emergency conditions and fire resistant materials have been used throughout in the ships' construction. All passenger cabins and crew spaces will be air conditioned as will public rooms except the main dining room which will be open on two sides to the sea breeze. The cargo capacity of each ship will be 418,900 cubic feet, 14,850 cubic feet of reefer space has been provided. The ships are 455 feet long with a normal speed of 17 knots.

THE various airlines still are reporting a shortage of good radiomen in both ground and flight positions . . . understand American is looking for men with either phone or telegraph licenses.

J. M. SOKASH wanting to break into the marine radio operating field. H. Smith and H. Weiss both engaged in the marine field in New York. N. Campbell off again on a leave of absence due to illness.



THE Navy recently announced the expansion of its training program in the training of technicians in all phases of electronics to be effective the 4th of November. The basic course for electronic technicians mates and aviation electronic technicians mates will be extended from twenty to forty-two weeks under a program designed to fill 7900 positions now open in these ratings. The present advanced training course of twenty-eight weeks will be continued.

TODD shipyards which operate half a dozen ship repair yards on the Atlantic, Gulf and Pacific have taken over the operation of the Charleston Shipbuilding and Dry Dock Company at Charleston, S. C., it was announced recently . . . this is Todd's first venture along the lower south Atlantic coast.

THE Maritime Commission awarded Meritorious Service Medals to Capt. S. Saamundsen, master of the "Anne Bradstreet," and to E. J. Quinlan A. B., aboard the "Henry W. Longfellow" . . . Capt. Saamundsen for his leadership while his vessel was under fire and bombing attack, Seaman Quinlan for his part aboard the "Longfellow" when fire broke out while discharging high octane gasoline.

TO GET back to the steamship business—keels for two new gypsum rock carriers were laid recently at the Kearny yard of Federal Shipbuilding and Dry Dock Company it was announced—the vessels will be built for the Panama Gypsum Company a subsidiary of the United States Gypsum Company and are scheduled for delivery next spring . . . each will have a deadweight tonnage of 10,350 and a capacity of 300,000 cubic feet will be 436 feet long and with a speed of about 12 knots . . .

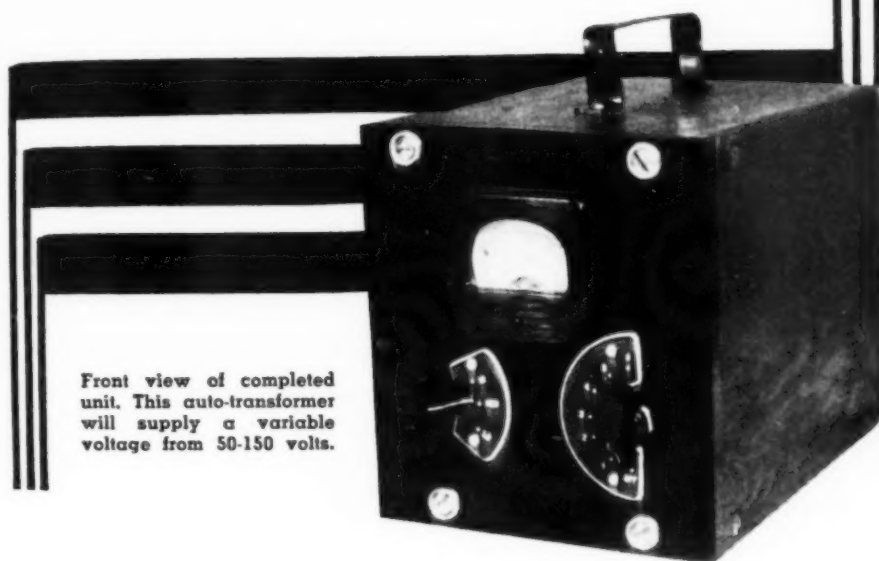
The new craft will be single screw turbine jobs and plans call for them to operate between ports along the Bay of Fundy and the plants operated by the company at Boston, New York, Philadelphia or Jacksonville . . . carrying gypsum rock.

THE U. S. Maritime Commission recently announced the opening of bids has been put off in connection with the reconditioning of two Lykes vessels and that the opening of bids has been indefinitely postponed. . . . No reason was given for the delay.

SHIPYARD production in 1946 will exceed that of any peacetime year since before the first war according to J. Lewis Luckenbach, president of the American Bureau of Shipping and noted that all construction was concentrated in shipyards that existed before the last war with the exception of two war emergency plants that will complete their contracts shortly.

MR. LUCKENBACH reported that most of the ships were for private account with Government contracts. (Continued on page 98)

Designing an AUTO-TRANSFORMER



Front view of completed unit. This auto-transformer will supply a variable voltage from 50-150 volts.

By R. L. PARMENTER, W1JXF

Transformers, found in most junkboxes, will provide sufficient material to construct this handy gadget.

PROBABLY one of the most useful gadgets around the ham shack or experimenter's workbench is something that will provide a variable line voltage at a fair degree of current handling ability. Most laboratories and electrical workshops make extensive use of continuously variable transformers such as Vari-tran or Variacs. While these are not prohibitively expensive by any means and are now generally available there are many of us who would prefer to make use of something that we probably already have on hand. Also the saving of a few dollars usually seems to appeal to most of us. It has been my experience that while many of us will get along without the convenience that a transformer like this provides, once we have used one we will come to depend upon it more and more since it is a piece of equipment that may be used every day. We use it for reducing power input to our transmitters while making adjustments and tuning up, checking appliances, as a soldering iron control to keep the iron fairly hot but not hot enough to blacken it or burn it out and last Christmas we used it to reduce the line voltage when two of the irreplaceable tree bulbs burnt out.

Our original idea was to start from

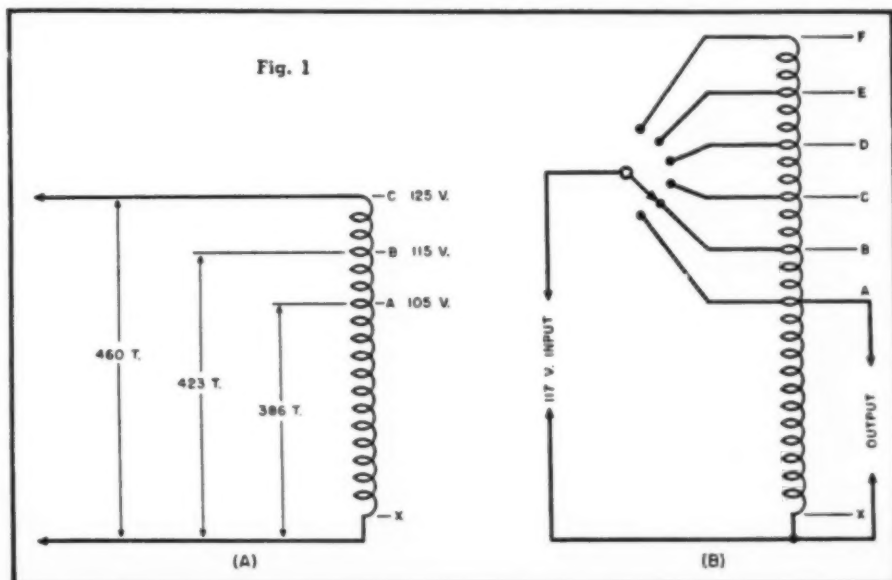
scratch with a fairly husky power transformer core and wind a complete winding which would provide a variable voltage from about 50 volts to about 150 volts at a current rating in the neighborhood of 1 to 3 amperes. This is quite feasible if the iron for the core and wire for the winding is available but while we

were looking through the junk box we came upon a unit which had a tapped primary with a shorted high voltage secondary. We decided to make use of this since much better usage of the windings could be made and the resultant voltages would be close enough to the desired values.

The transformer used was a 120 watt unit which originally delivered 1200 volts, center-tapped at 200 mills and two filament windings of 2.5 volts and 5 volts. While the following exposition will be specific as to values, the methods used in figuring may be applied to any unit of comparable size and rating. The transformer was hooked up to the 115 v. line through a 100 watt bulb at first as a precautionary measure. When it was ascertained that the high voltage secondary was merely opened and not shorted, we connected the 115 volts on directly and noted the low voltage secondary values of potential. The laminations were then removed and the core stripped of its high voltage winding, necessary caution being observed not to damage the insulation. Then the low voltage windings were carefully removed and the turns for each counted. By this means the turns-per-volt ratio was ascertained to be 3.7 turns per volt. Since this value is used in subsequent calculations it is important that it be found as accurately as possible either by the foregoing means or by means of a transformer table which lists core sizes and primary turns for certain voltages as well as wire sizes needed. These are available in many electrical handbooks as well as the ARRL "Amateur's Handbook."

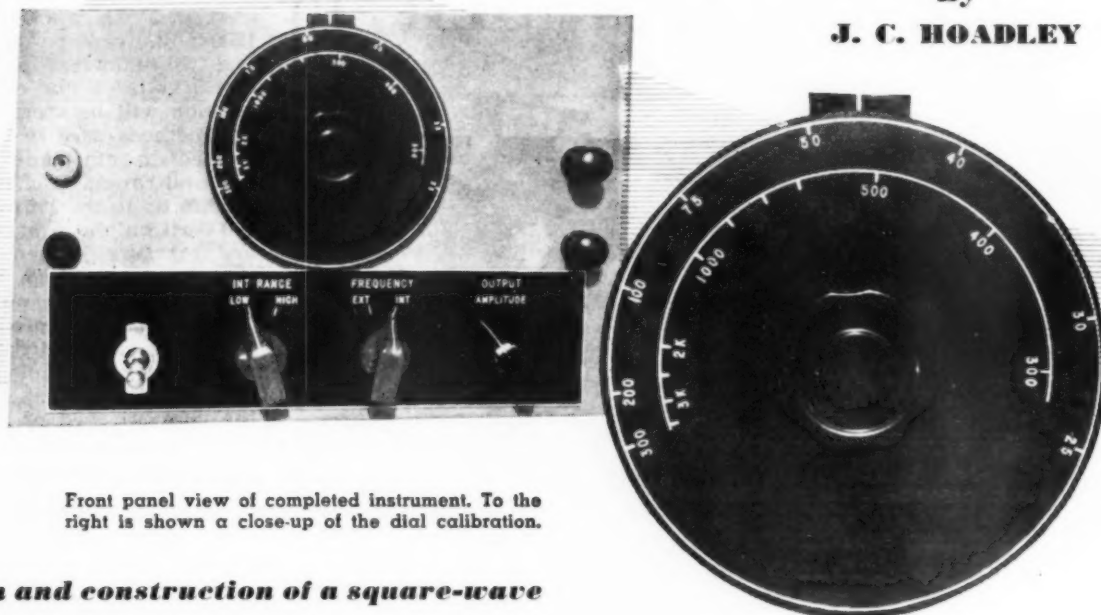
Since the primary winding was tapped for three voltages we assumed these to be 105, 115, and 125 volts which are the most commonly used. On a basis of 3.7 turns per volt this will figure to 460 turns tapped at 423 and 386 turns. Reference to Fig. 1A will show these voltages at their respective taps. It will be obvious at this point that more windings must

(Continued on page 134)



Simple SQUARE-WAVE Generator

By
J. C. HOADLEY



Front panel view of completed instrument. To the right is shown a close-up of the dial calibration.

The design and construction of a square-wave generator which is simple and easy to build.

A HANDY unit for rapid observation of the characteristics of amplifiers and other equipment is a square-wave generator. It has a host of other uses, such as an electronic switch, supplying blanking pulses for the Z axis of an oscilloscope, and keying and synchronizing slave type multivibrator and trigger circuits.

The type of generator which is to be discussed here is the variable frequency symmetrical type, that is, one which produces a square wave, the frequency of which may be varied by the observer, and the output of which is a series of square waves with uniform spacing. A desirable waveform is shown in Fig. 1A. This is an ideal square wave.

Certain factors contribute to a departure from the ideal square wave. The most important of these is capacity. In the course of generating a square wave, capacities must be charged and discharged and this takes

time. Therefore, the front of the square wave will have a slope, instead of rising in an infinitely short time. The steeper this slope, the faster the rise time and the more desirable the wave. The same thing is true of the fall.

In the interest of making these rises and falls as rapid as possible, particular attention must be given to the lowering of circuit capacity and the choosing of low impedance circuits. A given value of capacity has less effect on a low impedance circuit than on a high impedance circuit. It is obvious that a given capacitance will discharge faster through a low resistance than a high one.

A square wave can be generated with a multivibrator circuit, which is really a two stage, resistance-coupled amplifier with its output connected to its input. The time constants formed by its grid resistors and coupling condensers determine its frequency of operation. When $R_1=R_2$ and $C_1=C_2$, the

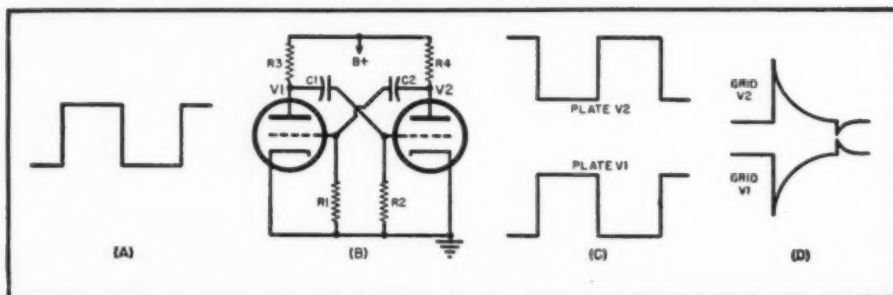
square wave will be symmetrical, pre-supposing $R_1=R_2$ and V_1 is similar to V_2 .

The multivibrator operates in the following manner. In Fig. 1B, plate voltage is applied causing a drop across R_1 , due to V_1 drawing current. C_2 charges, shoving the grid of V_1 down a negative amount equal to the drop across R_1 . This cuts off V_1 . C_2 now starts discharging through R_1 . The time for C_2 to discharge to a value that will allow V_1 to again draw current is determined by the formula $T=RC$. The voltage applied to the grid of V_1 should be several times cut-off for the type of tube selected. This voltage is sometimes made as high as the square of the cut-off voltage to increase the effective time constant. This increase in time constant is not a linear function, however. Due to the exponential nature of the condenser's discharge, the time, as computed by $T=RC$ will be longer than the actual time which will be given by $2T=RC$. This value is approximate.

When the voltage on the grid of V_1 falls to below the cut-off value for the chosen tube, V_1 draws plate current through R_2 . The plate of V_1 is pulled down, charging C_1 , driving the grid V_1 negative, shutting off V_2 .

The plate of V_2 rises to "B+". This positive movement charges C_2 positively which drives the grid of V_1 very positive. This action happens very fast, the grid of V_1 being driven positive before the plate of V_1 has finished charging C_1 . The result is an extremely sharp waveform on the plate

Fig. 1. (A) Ideal square wave. (B) Simplified diagram of the multivibrator. (C) and (D) show waveforms at various plate and grid terminals of the multivibrator.



of V_1 . This square waveform may contain frequencies as high as 10 megacycles.

This grid, however, draws grid current as it is driven so far positive and acts as a diode, rapidly discharging C_2 to a point where V_1 no longer draws grid current.

The wave shapes at the different points are shown in Figs. 1C and 1D.

It may be desirable to operate the square-wave generator from an external frequency source. This source usually takes the form of a sine-wave generator or audio oscillator. For this purpose, a switch is included which selects either the self-contained multivibrator frequency source or the squaring circuit which converts a sine wave into a square wave as shown in the diagram, Fig. 2.

This is another two stage amplifier, so arranged that the second tube is driven from cut-off to zero bias. This imparts a flat top and bottom to the sine wave. The first tube is an amplifier so that the input sine wave need not be of very great amplitude, in the order of 10 volts.

This first tube imparts squareness to one side of the sine wave because the tube is operated without any bias voltage.

The square wave, either from the multivibrator or the squaring circuit, is introduced into a clipper tube which is a pentode with a very high plate resistor and no grid bias. This tube improves the squareness of the square wave on the positive side, because when the square wave on its grid goes positive, nothing happens, as the tube is drawing practically all of the current it is capable of drawing through the high plate resistance. When the square wave goes negative, the tube cuts off and the plate swings up to "B+." As the resistance is high, any capacity to ground at this point will materially slow this action.

(Continued on page 161)

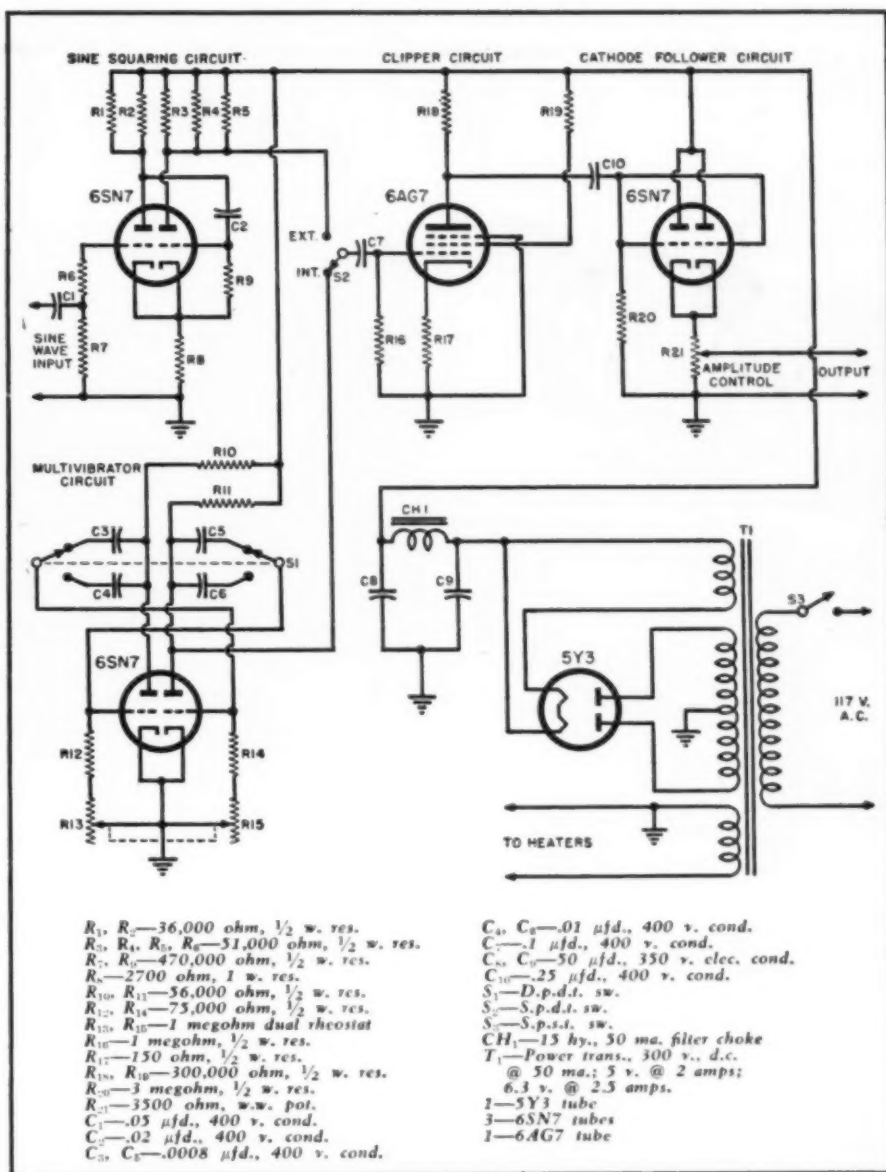
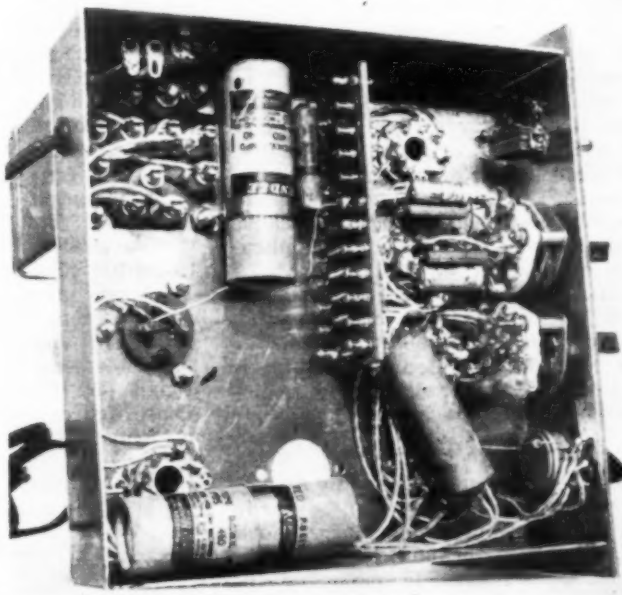
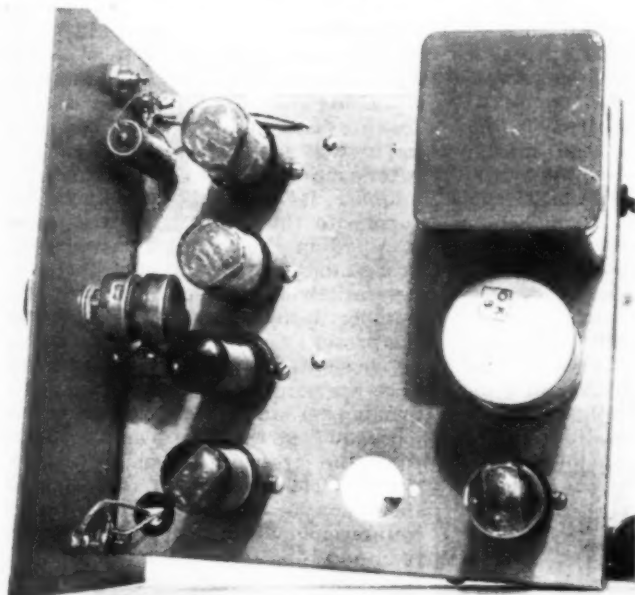


Fig. 2. Circuit diagram of the 5-tube, a.c. operated square-wave generator.

Top view of unit shows placement of parts on the chassis.

Bottom view shows placement of under chassis components.



Autotune Transmitter

AN/ART-13

By

GEORGE LICHTERMAN

Belmont Radio Corporation,
Agency of War Assets Administration



AN/ART-13 sub-chassis and miscellaneous component parts.

MODEL AN/ART-13 Aircraft Radio Equipment is the long-range transmitter section of the modern communications systems used in medium and large Army and Navy aircraft. Navy men know the equipment as Model ATC or ATC-1. When the Armed Forces decided that their procurement was in surplus of peacetime needs, *Northwest Airlines*, *Pan-American*, *TACA Airways* and others purchased the equipment under the airlines' priority preference provisions. A limited quantity is still available to the general public.

Nominal power output of the transmitter is 100 watts. It covers two frequency ranges, 2 to 18.1 mc. with no accessory equipment and 200 to 1500 kc. with the addition of a low-frequency oscillator and an external loading coil. The 2 to 18.1 mc. range includes the 80, 40, and 20 meter amateur bands and marine, police, forestry, relay-broadcast and aircraft frequencies.

This article will describe the equipment, an a.c. power supply to replace the aircraft battery and dynamotor, and an easy modification for crystal control. The low-frequency accessories will not be discussed because these frequencies have few applications of general interest.

AN/ART-13 was perfected to fill the need for a modern, high-powered, compact, and lightweight transmitter that could be operated and automatically tuned from either the radio-room or remote location.

General Description

Despite its light weight, only 67 lbs., the transmitter construction is sturdy and rugged enough to take the shock and vibration encountered in warplanes. It is housed in a black wrinkle-finished aluminum cabinet 23%

inches wide by 16 inches deep by 11% inches high. The cabinet may be mounted on a rubber-cushioned shock-mount base.

The modern trend toward subassembly construction allows a lot of equipment to be packed into a small space without making components inaccessible.

Manual tuning and Autotune presetting are done with five dials on the transmitter panel.

Keying speeds up to 30 words per minute may be used on c.w. and m.c.w. operation without objectionable "chirp" or distortion of the length of the keyed characters. Both the 1000 c.p.s. tone oscillator and the speech amplifier work into an audio circuit which is capable of modulating the full-power r.f. carrier (100 watts nominal) at least 90% for m.c.w. or voice emission.

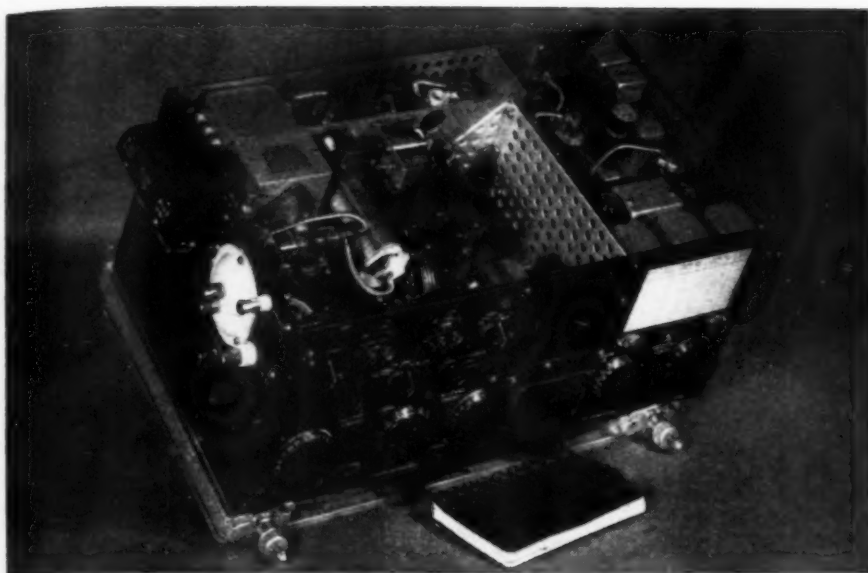
The "B" dial calibration is corrected by zero-beating the master-oscillator frequency with the output of the crystal-controlled calibration oscillator. The crystal furnished in the calibration oscillator is accurate to within .01% from 0° C to 70° C. The maximum frequency deviation due to temperature and humidity changes after the transmitter has been tuned for temperatures between -10° C and +50° C is only .0126% at 6 mc. These figures are not applicable if the transmitter is modified for crystal control. With crystal control, the frequency stability will be the same as the stability of the crystal used.

Autotune

The Autotune mechanism is a highly accurate motor-driven automatic tun-

ing system which allows selection of either manual tuning or any of 11 pre-tuned frequencies by turning a switch to the channel number desired. The 11 channel positions of the "Channel" switch on the transmitter panel are duplicated by a "Channel" switch on the remote control box. (The remote operator has no need for the "Manual" position of the switch.) Ten of the pre-tuned channel frequencies may be in one narrow range or they may be scattered among a number of frequency bands from 2 to 18.1 mc. The 11th position, "Low Freq.", is used in conjunction with the low-frequency accessory equipment to switch in a single pre-tuned frequency from 200 to 1500 kc.

Presetting the five control knobs for an Autotune channel is almost as simple as manual tuning. Each knob has a locking bar. To tune manually, the locking bars are left tight, the channel switch is turned to "Manual," and after the Autotune mechanism has stopped its motion, the knobs are turned to tune the transmitter as instructed in the calibration book. To preset an Autotune channel, the channel switch is turned to the channel number desired for the frequency being preset. Any of the 10 numbers may be chosen. Assume, for example, that 6 is the number selected. After the mechanism stops, the locking bars are loosened and the knobs are turned to tune the transmitter as in manual tuning. The position of each knob is then noted. They are next turned counterclockwise about one-quarter turn and then turned back to the positions noted. The locking bars are then tightened while the knobs are held at



Top view of AN/ART-13 transmitter. It is also known as Navy model ATC or ATC-1.

Conversion details for modifying a recently released surplus item. Instructions for converting to 117 volts a.c. operation are fully covered.

the noted positions. This completes the presetting for channel 6. Another frequency and channel number may be chosen and the procedure repeated, or manual tuning may be done, but as long as the locking bars are not loosened when the channel switch is at 6, the channel 6 setting will not be disturbed.

Power Amplifier

The power amplifier tube, at all frequencies, operates as a class C amplifier with -40 volts on the grid.

Audio Circuits

The audio circuits consist of a first audio stage, a driver stage, a class B push-pull modulator, a side-tone amplifier, and an m.c.w. tone oscillator. The microphone, the m.c.w. tone oscillator, and the crystal-calibration detector all feed to the first audio stage. Either a 40-ohm carbon or a 200-ohm dynamic microphone may be used.

Circuit values are chosen to provide equal voltage from either mike at the primary of the input transformer.

The modulator uses two high-mu triodes connected in push-pull. "CW" relay contacts, K103B, remove plate voltage from the modulators when c.w. emission is selected.

The push-pull output transformer has two secondaries, one to modulate the screen of the power amplifier while the other modulates the plate.

Calibration Circuits

Tuning accuracy is assured by a crystal-controlled oscillator circuit which provides calibration correction points every 100 to 600 kc. Calibration

is performed by zero-beating at the nearest check point given in the calibration book, and then moving the "B" dial pointer to correct the dial reading at the check frequency. The master-oscillator frequency is beat with the calibration-circuit output at intervals of 50 kc., but since the master-oscillator frequency is multiplied from 2 to 12 times, the 50 kc. check intervals are also multiplied by the same amount.

A regenerative frequency divider circuit is used with a 200 kc. crystal as the controlling standard. Plate voltage is applied to the tubes in the circuit only when the "Calibrate-Tune-Operate" switch is in the "Calibrate" position.

A.C. Power Supply

In order to make Army-Navy surplus more suitable for civilian use, the Belmont Radio Corporation agency of the War Assets Administration maintains a laboratory to work out recommendations and circuits which can be built by radio amateurs.

Any power supply for the AN/ART-

13 must take into consideration the need for a 28-volt d.c. source to drive the Autotune motor and to energize the relays, because a.c. replacements for these components are not available. Fortunately, many dry-disc rectifiers are available now as surplus equipment at moderate cost. It was therefore decided to design a power supply which can be cabled to the transmitter and which requires no changes in the transmitter.

The power supply circuit illustrated furnishes the plate and screen power formerly obtained from the dynamotor and also supplies 28 volts d.c. for the filaments, relays, and Autotune motor. The power supply outputs are wired as shown into a 9-conductor cable and terminate in a Type U-7/U plug; this plug is one of the AN/ART-13 components and is available with the transmitter.

Note that pin 7 of the plug is left blank. When the dynamotor is used for power, a 10-conductor cable is used and current for a power-controlling relay in the dynamotor is conducted through pin 7. This current is, in turn, controlled by the "Emission" switch on the transmitter panel or on the remote control box.

It is important to note that the "Off" position of the "Emission" switch does not remove power when the a.c. power supply is used. The switches shown in the a.c. power supply schematic must be used to turn the equipment on and off.

Crystal Control

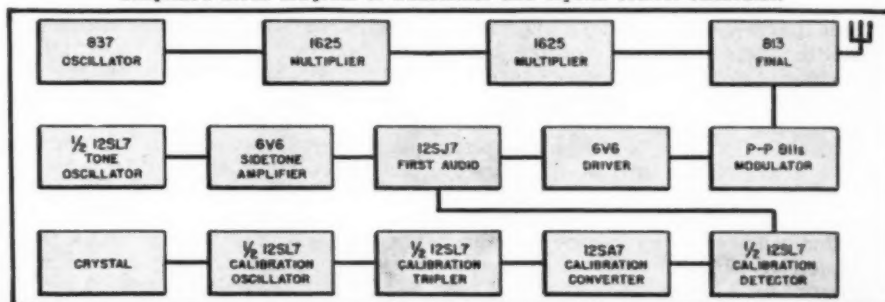
Despite the excellent stability of the AN/ART-13, it may be desired to crystal-control the master oscillator.

The master oscillator circuit is exposed by removing the mounting panel from the bottom of the transmitter, removing the black panel on the right end of the transmitter, removing the CFI subassembly, and, finally, removing the aluminum cover plate marked "Removal of cover changes—etc."

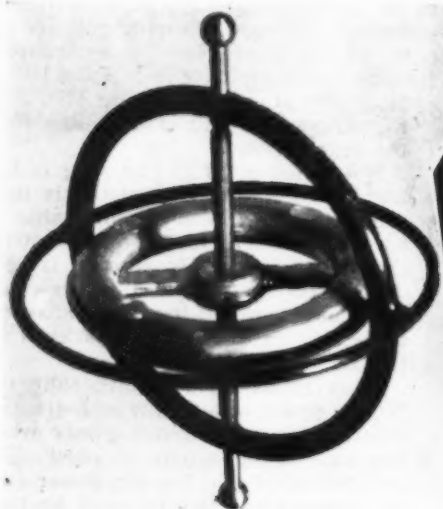
In order to retain the Autotune feature and to modify the original circuit as easily as possible, it was decided to use a crystal as a frequency-selective filter in the control-grid circuit. Bias resistor R101 (22,000 ohms) was left connected to the control grid (pin 4), but the lead from the grid to the tank circuit (junction of C104 and C103) was cut and a crystal was inserted.

(Continued on page 74)

Simplified block diagram of transmitter and crystal control calibrator.



Build Your Own High-Speed Photo Flash



Action "stopped" although this top was rotating at high speed.

By
L. M. DEZETTEL
Eng., Allied Radio Corp., Chicago

This high-speed electronic photo flash can be constructed at an approximate cost of \$50.00.

SINCE a unit for high-speed flash photography is an electronic unit in function, and photographic hobbyists are numerous among electronic and radio men it was felt that a description of an easily constructed unit might not be out of place in the pages of RADIO NEWS. The operation of this unit is simplicity itself. Its construction is easy, all parts being available from radio and electronic parts houses. The glow lamp and high capacity, high voltage condensers are now being made generally available. The high voltage transformer was especially wound for the purpose, but it, too, is now available.

The heart of the unit is, of course, the glow lamp. This lamp is especially constructed to contain a conductive gas under low pressure, which becomes conductive only at a high voltage. Approximately 1700 volts is required to make the lamp "strike." Around 2000

volts was found best for the one used here. When conducting current, the lamp's resistance is about 6 ohms.

Here is something for one's imagination to play with: What is the current when 2000 volts is applied across 6 ohms? Yes, 333-plus amperes! That's what the power supply of this unit delivers to the lamp, but it is only instantaneous.

The high voltage a.c. from the secondary of the power transformer is rectified by a 2X2/879 tube, the resultant d.c. being used to charge up a bank of condensers. A protective resistor of 100,000 ohms is used to keep peak charging current down and protect the rectifier tube and transformer. The transformer also has a filament winding for the heater of the 2X2 tube. A normally open s.p.s.t. relay closes the circuit from the condensers to the lamp. It takes about 15 seconds to charge the condensers, but about

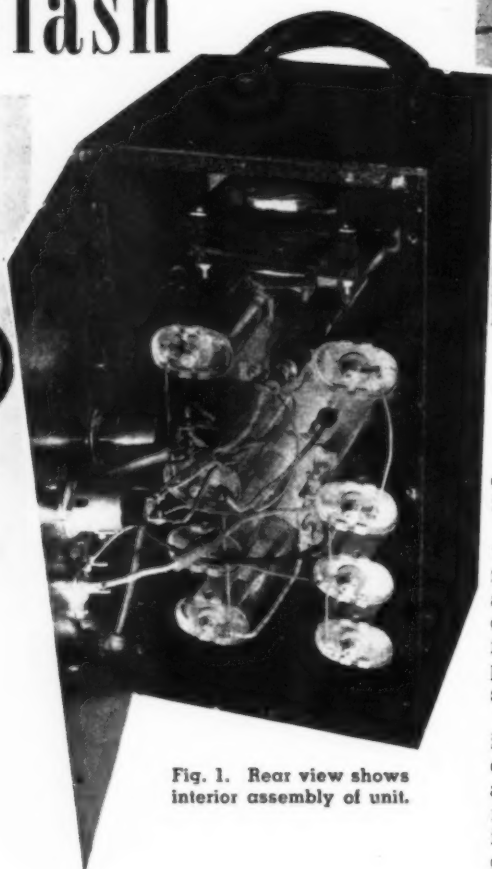
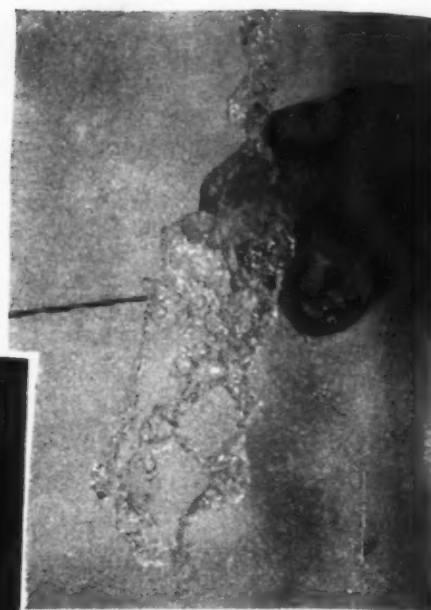


Fig. 1. Rear view shows interior assembly of unit.



"Frozen" water—air bubbles provide ideal shot for high-speed photography.

one "steenth" of a second to discharge it through the lamp.

No tests were made to determine the actual speed of the flash. The manufacturer states that the bulb has a speed of approximately 1/15,000 second. Whatever it is, it's fast enough for most high speed photographic applications, as attested by the sample shots shown here.

A bank of eight separate condensers is used as the "energy storage condensers." While this is often supplied as a single block, it was figured that replacement costs would be lower with individual units. Eight 3 μ fd. condensers make a total of 24 μ fd.

If you prefer "watt-seconds," which is directly related to light output, use this formula: $\frac{1}{2}CE^2$, or about 58 watt-seconds (our voltage is about 2200). These condensers have a plastic dielectric, heavy internal leads, and low apparent reactance.

This unit probably has its greatest value in portrait photography, especially of children. Your subject no longer needs to squint and squirm under powerful and blinding photofloods. Use a small house lamp in a reflector to get the shadows just right, then move the high-speed lamp into its place and fire away. Pupils of your model's eyes will be large and eyes will be bright. Children's expressions are caught easily, with absolutely no trace of movement. Think of the money you save on flash-bulbs. There is no available information on the life of the bulb, but the manufacturer believes that 5000 flashes, at least, may be expected. At that rate, and with the parts for building this unit totaling about \$50.00, your flashes cost you about "a penny a shot."

Fig. 3 shows the general view of the completed unit. The main part is housed in a tall metal case such as

those used for amateur transceivers. As indicated in the schematic diagram this main part is essentially a high voltage power supply. The glow lamp is installed in a standard reflector used for No. 1 photofloods. It is connected to the power supply by means of a coaxial type cable with high dielectric strength. Two more cables come from the power supply case—one for the 115 volt a.c. primary power source and another for the flash gun on the camera.

The power supply case measures $15 \times 7\frac{3}{4} \times 7$ inches. This is just about the minimum of space that will house all of the parts. The chassis was built especially for the job and measures $6 \times 13 \times 2$. Both the front and back sides are removable by means of self-tapping screws. The chassis lip was made to fit between the back and edge of the case, and is mounted vertically. Nearly all of the parts and wiring are on the top or front part of the chassis. One small 115 v. bulb and one neon bulb are mounted on the front panel, in pilot light brackets. All three cables and the a.c. "on-off" switch are also on the front panel. The back panel carries only the synchronizing control. Facilities were at hand for engraving a bakelite panel for identifying the cables, etc., on the front panel but, obviously, any type of markings will do.

Fig. 1 shows a view of the interior with connections to the back of the front panel. Note the heavily insulated wire used in the high voltage circuits.

The actual layout of parts on the chassis is not important. Care must be taken to see that the high voltage leads are isolated from other wires and parts, and from ground. At least a half inch clearance should be allowed to prevent arcing. So that the front panel may be easily placed into position after wiring, and for easy servicing later, no direct solder connections were made to the parts mounted to the front panel. The high voltage lead has a banana plug connector on it. Other leads have solder lugs on them and are fastened with screws.

The glow lamp socket assembly is a bit tricky but a professional job will result if the illustration and these instructions are followed. To start with it is necessary to obtain the outer shell of a bakelite a.c. socket of the pendant type. The cable is fed through the back of the socket and is connected to the No. 2 and No. 4 terminals of a 4-prong replacement type tube socket.

Remove the No. 1 and No. 3 terminals from the tube socket. Fit it into the end of the a.c. socket. Drill and tap two 6-32 threads, one opposite the No. 1 and one opposite the No. 3 terminals. Fasten the 4-prong socket to the a.c. socket by inserting screws into the tapped hole. These screws must be short and of the headless type, like those used in radio control knobs. They must be short enough so that

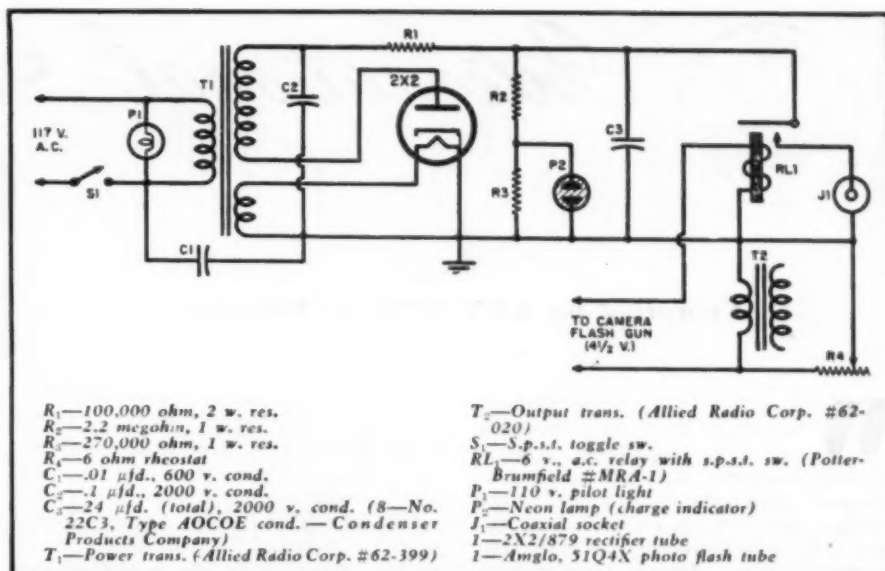


Fig. 2. Schematic diagram and parts list for electronic high-speed photo flash unit.

the head clears the reflector thread on the a.c. socket and does not protrude through the prong holes of the 4-prong socket. Now disassemble the socket and thread the coaxial cable through the back of the a.c. socket. Skin the cable to expose the inner conductor and some of the outer conductor, with about $\frac{1}{2}$ inch length of the polyethylene insulation between. A few turns of a heavy bare wire (about No. 10) should be wrapped around the outer conductor and soldered securely. This wire is brought up short and soldered to the No. 2 terminal of the 4-prong socket. The inner conductor is soldered to the No. 4 terminal. These connections must be well made or they may twist off when the reflector assembly is moved about later.

While the coaxial cable was selected for its insulating qualities, frankly, it is a little unwieldy. A flexible, two-conductor cable would be more acceptable, but the insulation between conductors must be capable of standing better than 2000 volts.

Wiring is straightforward, and according to the schematic diagram. All leads going through the chassis of panels should be protected from shorting to the metal by means of rubber or phenolic grommets. When you are ready to turn the unit on, remember one thing. The power supply develops about 2000 volts. Make a mental sign and keep it in mind always: DANGER—HIGH VOLTAGE.

The only adjustable control, used for synchronizing, is mounted on the back panel. It is not shown in the illustrations. It could just as well be mounted inside the case somewhere because, once adjusted to your camera's synchronized flash gun it need not be readjusted.

Adjustment and Operation

Probably the most novel feature of this unit, and one not yet found in commercial units, is the simple means of synchronizing with your flash gun without the necessity of upsetting the

(Continued on page 73)

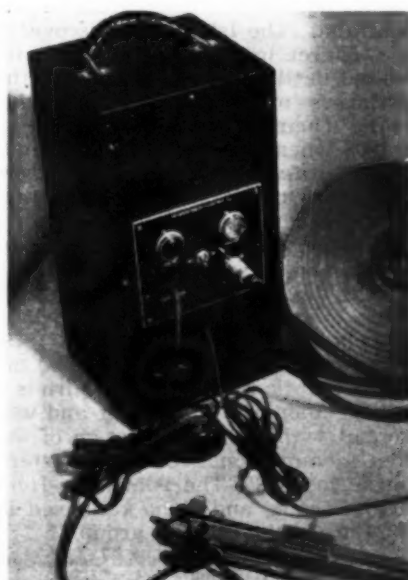
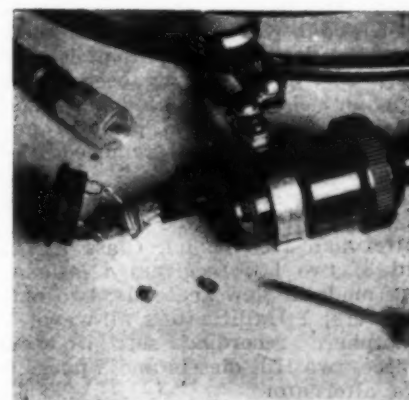


Fig. 3. External view of completed unit. Special photo flash bulb is shown in reflector at lower right.

Fig. 4. Details of lamp socket assembly. Cable and parts must withstand a breakdown potential of at least 2000 volts.

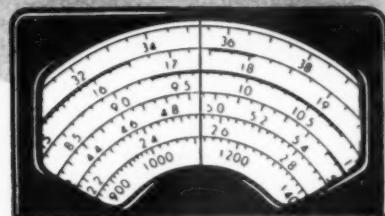




International

SHORT-WAVE

Compiled by **KENNETH R. BOORD**



WE ARE indebted to Charles A. Black, York, Pennsylvania, for some interesting data regarding Radio Station ZKG, located on Pitcairn Island, the spot of land in the Pacific of "Mutiny on the Bounty" fame. In a letter-*verie*, dated August 7, 1946, Nelson Dyett, Operator-in-Charge of ZKG, wrote:

"Your letter was handed to me by Andrew Young who operated VR6AY before the war and who would like to renew activities on 20 meters again now that the war is finished.

"The fact of the matter is that Mr. Young has applied for the renewal of his license but the Administration has so far failed to acknowledge his application. You may be interested to learn that VR6AY was active all during the war from December, 1939, to May, 1944, when the station was superseded by the present station which from that time became the Official Naval Station for this area of the Pacific.

"I am a New Zealander and came here to reorganize VR6AY, bringing my own gear, and to operate a coast-watching and weather-reporting station. Contact was maintained with both ZLW and VPD. Incidentally, my 'ham' call was ZL2FM before the war and when I return to New Zealand at the end of the year, I will become active once more.

"Like Andrew Young, I applied for a call under which I could operate on the 'ham' bands from here, but my application has been ignored completely . . .

"The transmission which you overheard was made on ZKG4, 12.110, and I was actually talking to the doctor on a passing ship, its transmitter having been on 425 kcs. A young boy on the Island required an emergency operation and I was getting instructions from the doctor. The patient is now quite well again, having been taken away on a ship carrying a doctor. The physician was able to perform another operation that removed the cause of the boy's trouble."

Mr. Dyett stated further that "the gear here consists of 750 w. m.f. transmitter and 1000 w. h.f. Class A1, 2, and 3; two h.f. receivers (National type made in New Zealand); two m.f. receivers; 1 Hallicrafters all-wave; 1 Ionosphere recording set; power source, two Hill diesels and 3-phase 6 kva. alternators.

"High frequencies employed are ZKG3, 8.635; ZKG4, 12.110; ZKG5, 7.270; ZKG, 8.290 and 12.450. A medium-wave frequency of 500 kcs. and QSW frequencies are used also. Operating schedules include these: ZKG4 works ZLW6 at 1:30 p.m. EST; * ZKG5 works VPD at 2:45 p.m.; and ZKG, 500 kcs., works at 1-5 p.m., or as required; no public correspondence is handled but WX broadcast."

(Verification from VR6AY, Andrew Young's station on Pitcairn in prewar days, were much sought after by ardent DX verifiers the world around.)



Kenneth R. Boord

Pitcairn Island is located in the Pacific, equidistant from America and Australia. The Island was discovered by Carteret in 1767 but was not inhabited until 23 years later when the mutineers of the "Bounty" landed there. Their existence became known in 1808 when ships visited the islands and gave assistance to the mutineers and their Otaheite women. The population became too large for the resources of the Island and the mutineers and their women, 192 in all, moved to Norfolk Island in 1856. Later, forty returned to Pitcairn and the population increased to 90 by 1879.

The area is two square miles and the 1941 population was 193. Pitcairn is a British Colony by settlement and was brought within the jurisdiction of the High Commissioner of the Western Pacific in 1898. The islands of Henderson, Ducie, and Oeno (annexed in 1902) are in the Pitcairn group.

* Unless otherwise indicated, all times herein are American EST, 5 hours behind GMT.

Good Antennas

Many inquiries have been received by this Department concerning antenna systems for use in the reception of international short-wave signals. This month we present views on this subject as expressed by Frank E. Wooley, Irvington, New Jersey, member of the ARRL and a radio man of wide experience:

"Through the years, I have had various and sundry arguments on the subject of 'good antennas' from those who should know better and also from those who, due to misleading advertising and advice, did not know but who lived to learn later that all stories to the contrary, *you cannot beat a good skywire, when results are all tabulated.* (I challenge anyone who doubts this to send me proofs to the contrary. I'm from the well-known 'show me' stock, backed up by some thirty years' experience with everything from crystal to 'super-duper'.)

"For a moment, let's look at the basic function of the vacuum tube. You will find that regardless of the many refinements and dual and triple functions of the general run of tubes, they are, in a simple way of putting it, a mere form of electronic relay, and can only pass on what they receive in the first place, nothing more.

"There are those—and their number is far too great—who feel that all one needs in a radio is a quantity of tubes and you're all set to bring in the world. And what a howl we hear from some of them when this does not happen! I think that if there is any one part of the average radio receiving equipment that is neglected and considered as 'any old thing will suffice,' it is the average antenna used today by perhaps a majority of listeners, both BCB and SW.

"Yes, I can hear someone saying, 'This guy is "nuts," I get all over and I don't have an antenna on my set,' or something to that effect. (I have serviced many defunct sets during the last few years, and can assure you that is really a stock phrase!) I candidly admit that with the more modern types of receivers—particularly, multi-tubers—results of a sometimes remarkable nature are achieved, but what good are 'freak' results? They are never stable—so why handicap a good receiver with a junky antenna rig?

"What clear-thinking man would

SPRAGUE TRADING POST

is coming Back!

Your Own Swap, Buy or Sell Advertisement Run FREE—Send it in today!

Have you any parts or equipment you'd like to trade or sell to some other radio man who could put them to good use?

Are there any hard-to-get items you'd like to buy?

Want to get a radio job — or to hire a helper?

If so, write up your advertisement in brief form, rush it to Sprague. We'll run it **ABSOLUTELY FREE OF CHARGE** in the famous Sprague Trading Post that will start again next month in seven leading radio publications: **RADIO NEWS, RADIO CRAFT, QST, SERVICE, RADIO SERVICE DEALER, RADIO MAINTENANCE** and **RADIO & TELEVISION RETAILING.**

This famous Sprague service needs no introduction. During the war over 12,000 individual free classified advertisements were run for our friends. Everything, from parts and equipment to complete radio shops, was bought, sold and exchanged as a result.

In discontinuing The Sprague Trading Post at the close of the war, we thought there was no longer any need for it. But we were wrong! Hundreds of letters flooding in from all parts of the country tell us so. "*We need this sort of thing now as much as we ever did!*" is the gist of what our service and amateur friends say, "*Start it going again!*"

And so we're doing it! Send in your swap, buy or sell advertisement today!

Sincerely yours,

Harry Kalker

Harry Kalker
Sales Manager

**THIS IS THE WAY YOUR
FREE AD WILL LOOK**

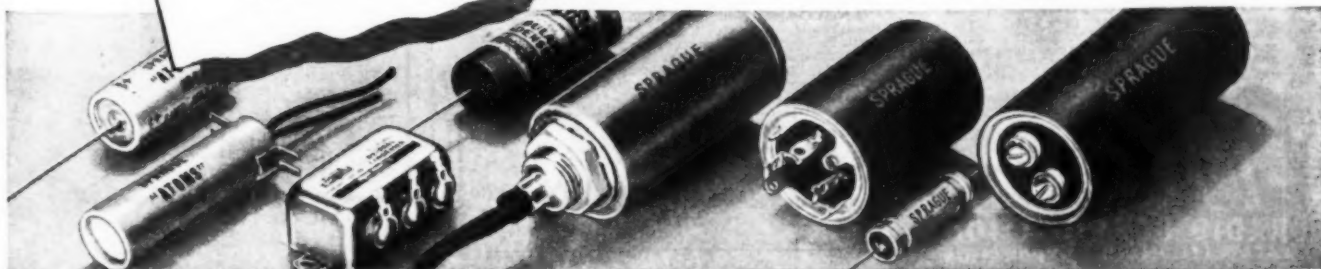
FOR SALE — Standard model all-wave signal generator, \$25; modern tube tester with adapters, \$27.50; popular phono motor, \$15; power transformers and other parts. Write for list. **YOUR NAME and ADDRESS HERE.**

WANTED — Input i-f transformer and oscillator coil assembly for Model 15 Majestic. Will pay cash or trade. What do you need? **YOUR NAME and ADDRESS HERE.**

HELP WANTED — Need radio service man for busy dealer store in small Midwestern city. Well equipped shop. Write giving full details of experience. **YOUR NAME and ADDRESS HERE.**

INSTRUCTIONS: Print or type your advertisement **CLEARLY.** Hold it to 40 words or less including name and address. Confine it to radio subjects only. **MAKE IT EASILY UNDERSTANDABLE!** No commercial advertisements are acceptable. Sprague reserves the right to reject any copy that, in our opinion, does not fit in with the spirit of this free service. Your advertisement will be run in the first possible issue of at least one of the seven magazines on our list.

**Write it now. Mail it to
Dept. RN126
SPRAGUE PRODUCTS COMPANY
North Adams, Mass.**



CAPACITORS AND *KOOLOHM RESISTORS FOR EVERY RADIO SERVICE AND AMATEUR NEED

*Trademark Reg. U. S. Pat. Off.

RADIO PARTS

ELECTRONIC EQUIPMENT

MONEY SAVING VALUES

**IMMEDIATE
SHIPMENT**

Concord has them! Radio & Electronic Parts, Supplies and Equipment of every kind, for every need... long-awaited, hard-to-get items... new merchandise, just received... Hundreds of bargains... in stock NOW for immediate shipment from CHICAGO or ATLANTA. Listed below are just a few of Concord's Money-Making Values in Top-Quality, Standard-Make Parts and Equipment. CHECK these offerings now — or write us your needs.



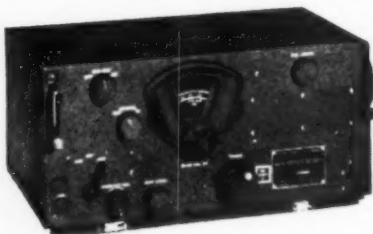
ALNICO V 5" P.M. SPEAKER

New Alnico V magnet provides maximum performance with minimum weight. Normal wattage 3, peak wattage 4½. V.C. impedance 3.2 ohms. depth 27/16". **\$1.98**
SB7009



3 Mfd. 4000 Volt Hi-Voltage Condenser

Large 3 mfd., 4000 v. DC. condenser, hermetically sealed in an aluminum can. Size 4½ x 3 11/16 x 7¼" high. **\$4.95**
SB3166



WELLS-GARDNER BC-348-N Communications Receiver, 6 Bands—300-500 KC. and 115 MC. to 18 MC. in 5 Bands. 2 stages RF, 3 stages IF., Beat Frequency Oscillator, Crystal IF. Filter, Manual or Automatic A.V.C. Complete with tubes and 24 V.D.C. input dynamotor power supply, but supplied with complete instructions and diagrams for converting to 110 V.A.C. 60 cycle operation. **BC-348-N \$53.95**



CARBON THROAT MICROPHONE

Will work into any 200 ohm impedance input circuit. Has adjustable strap to fit any neck. Ideal for ultra high frequency mobile work for hams. Supplied with strap, 16' cord and plug. **SB7060 \$49**



Supreme Model 543B 1000 O.P.V. A Sensitive Meter

Has pin jack terminals, and includes the following ranges: — 0/6/60/600 D.C. M.A., 0/15/150/600/3000 V. A.C. and D.C., 0/2000/200,000 ohms. This meter is convenient to carry. Weighs 28 ozs. Uses full size 3" meter with a rugged, accurate I.M.A. movement. All resistance ranges are operated by batteries furnished with the unit. Bakelite case. Size: 5 7/8" x 2 1/16" x 2 1/8". Shpg. wt. 2 lbs. **\$18.57**
C21745



D.C. MILLIAMMETERS

2½" flange mounting type. Black dull finish bakelite case. Mfg. Hdwe. included. — Large, clearly legible dial calibrations. Either **SB4122—0-20 M.A.D.C. or SB4116—0-300 M.A.D.C. \$3.23** Special

SAVE ON VALUES LIKE THESE

A POPULAR HAM TUBE AT A REAL LOW PRICE
9003 VHF Midget Super Control RF Pentode Tube **95¢**

HEAVY DUTY LINE FILTER
Solar Elim.-O-Stat. Completely shielded. Type EN106. SB3218 Each \$1.79

NEUTRALIZING TOOL KIT
12 tools Telescope into 5 units
Composed of alligator side wrench — 6" insulated driver—metal nib, 5/16" and ¼" nut wrench, ¼" ins. square nut wrench, ¼" hex metal side wrench, 2½" ins. driver with metal nib, ¼" hex slotted insulated wrench driver, 5/16" hex ins. nut wrench, 5" and 6" ins. driver. **SB6547 \$2.49**

WIRE STRIPPER
Strips wire instantly! Fastens to bench or other support. Wire stripped to any length. Strips wire up to 12 MM diam. Each **\$98¢**
C15268

AERIAL WIRE
Contains 7 strands—4 copper—3 of monel, 100 foot coils. **\$29**
SB5133

CRESCENT AUTOMATIC RECORD CHANGER

Simple, single control, plays ten 12" or twelve 10" records automatically. Rejects any record desired, or permits optional playing of records manually. Only three moving parts while changing. Fast... changes records in 5 seconds. Has self-starting, 78 R.P.M., 110 volt 60 cycle AC, heavy duty motor. Finished in two-tone brown with attractive plastic trim. Requires only 5¼" head room and fits any cabinet with 12½" x 16¼" changer area. **\$19.95**
C22503. SPECIAL

TUNER UNIT TU-10-B. Continuous frequency range from 10 MC. to 12.5 MC. VFO oscillator tuning section, buffer, coupling, capacitors and choke, and buffer output matching tapped coil and condenser. Size 16¼" lg. x 7½" h. x 5½" deep. **AS4132. SPECIAL \$2.95**

T-17-B 200 Ohm Carbon Mike. Lightweight, with press-to-talk button. Built-in filter to suppress carbon hiss. 5' rubber covered cable and **\$2.49**
PL-8 3-circuit plug supplied. **SB7062**
Midget Volume Control — 1 Meg. ohm Standard ½" Bushing, ¼" dia. Shaft, 3¼" long, with split ½" spline for push-on knob. **C8154 \$35**

STANCOR Universal Output Transformer Type A3856. Primary for all single or push-pull plates. Secondary adjustable from 1 to 30 ohms. Two-inch mounting centers. 4 watts at 35 mls. **\$1.32**
C1675. SPECIAL

Mail the Coupon Below Now!

for New Concord Bulletin of Radio Parts and Electronic Equipment. See 8 giant-size pages packed with Radio Needs—Condensers, Meters, Controls, Transformers, Switches, Relays, Tools, Amplifiers, Records, Players and Changers—new and scarce items—scores of bargains. MAIL COUPON NOW!

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901 W. Jackson Boulevard, Dept. E-126,
Chicago 7, Illinois
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City _____ State _____

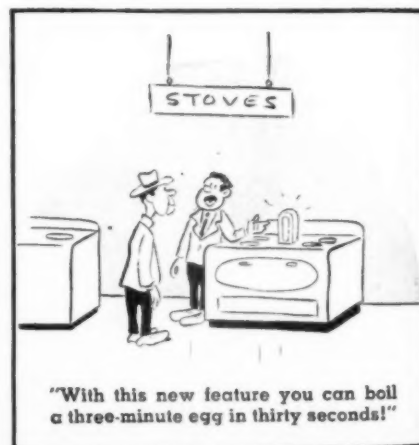
put a finely-designed, high-horsepowered outboard motor on an old, flat-bottomed rowboat? Sure, it would go—but how much better the general performance would be with a well-shaped, rounded hull! That may be a poor comparison, but the same holds for a good receiver, hooked up to wall plates, conduit, fixture attachment, grounded pipes, and the like. True, 'it works,' but how much better would it perform with the right medium to gather in the signals!

"The Hallicrafters Company has this item in every instruction book: Use an inverted 'L' of copper wire, approximately 75 feet long, outdoors, or a doublet cut to frequency. If all types of substitute and 'trick' antennas were satisfactory, do you think this manufacturer would hesitate to say so? (Some amateurs who wish to receive certain bands in preference to others may 'cut' the antenna to favor that narrower band of signals, but in general practice, I believe a straight wire antenna is the best general-purpose type.)

"I also have had good results with the 'matched' or 'all-wave' type of antenna. This has a coupling unit at the approximate center of the antenna wire, which feeds the r.f. signals via twisted pair to another unit at the receiver. This type cuts down 'hash'; the lead-in of twisted pair can be quite long; and this lead-in—unlike the regular lead-in—picks up no local interference, such as house and other equipment noises, and gives a narrow spacing on dials. This feature is especially good on strong, local broadcasters. It is good also for apartment house, hotel, and similar use, for that matter.

"Another satisfactory antenna which I am now using is the new Ver-trod System, No. 103—vertical rod, aluminum, nine feet, has coupling unit, then via twisted pair (or transmission line) and another coupling unit to set, similar to the 'matched' type just described.

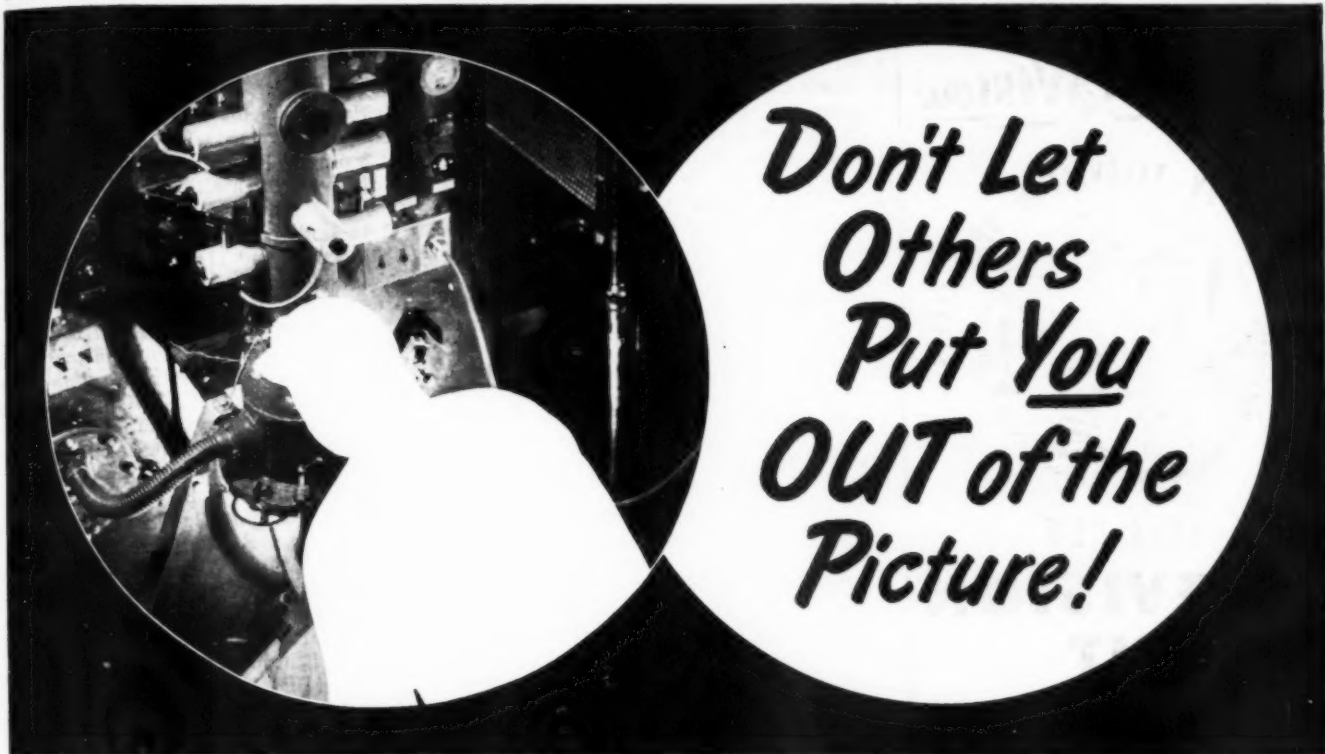
"Remember—snow, ice, and rain, as well as dirt and carbon dust from smoke, all may hinder good reception. And don't be afraid to insulate well. Use good glass—or better yet, Pyrex, insulators. In closing, I would stress another point: that of neatness. It's



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Here's How CREI Home Study Training Prepares You NOW for a BETTER Job and a SECURE Career in Radio-Electronics

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Never before have men like you had so many chances to step into brand new jobs in brand new fields. FM, Television, Facsimile and other electronic communications systems for both government and industry will require thousands of highly trained expert radio communications engineers and technicians.

NOW is the time to take the time to prepare yourself for these important career jobs. CREI home study training can show you the way by providing you with the "tools" with which to build a firm foundation of ability based on a planned program of modern technical training.

In our proved method of instruction you learn not only how but why! This is real, honest-to-

goodness practical engineering training that leads to better jobs and more rapid promotions . . . the type of training for which many thousands of professional radio-men have enrolled during the past 19 years.

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RESISTANCE

—To New Ideas Has Cost Many
A Man A Great Future.

We all know the classic stories of the people who scoffed at Edison, Ford, DeForest. It was the scoffers who lost out when the rewards poured in. Now with radio-electronics entering a great, new era, when it may well emerge in greatly magnified form, you fellows who are in on the ground floor and don't prepare now for the future fall in the same class as those early scoffers.

E. N. Riegle
President of CREI

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If you have had professional or amateur radio experience and want to make more money, let us prove to you we have the training you need to qualify for a better radio job. To help us intelligently answer your inquiry—PLEASE

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Gentlemen: Please send me your free booklet, "Your Opportunity in the New World of Electronics," together with full details of your home study training. I am attaching a brief resume of my experience, education and present position.

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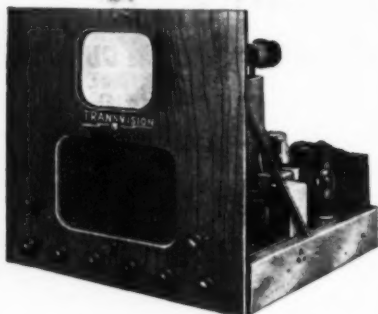


THIS NEW

TELEVISION KIT

Offers you a High Quality
TELEVISION RECEIVER

ready for Easy,
Rapid Assembly



Easy-to-Assemble: No knowledge of television required. **COMPLETE** easy-to-follow **INSTRUCTION SHEET** gives you all the knowledge you need.

This Kit **INCLUDES** SOUND, all component parts, and the following:—

1. Specially designed Television Antenna.
2. A \$30.00 Lectrovision seven-inch Picture Tube . . . plus ALL other tubes.
3. Pre-tuned R-F unit.
4. Finished front panel.
5. All solder and wire . . . and sixty feet of low loss lead-in cable.

Price: complete with ALL tubes, \$149.50. Shipment will be made approximately 10 weeks after receipt of order. \$25.00 deposit required on all orders, balance C.O.D.

We believe that the comparative quality of this set is superior to other available sets. For full information write to:

TRANSVISION, INC.

P.O. Box No. 364, New Rochelle, N. Y.

true, signals will come in on a corroded sloppy, poorly-built, 'half-baked-looking' set-up, but a neat one will give both you and your neighbors much more satisfaction. Try it! Give your set—old or new, communications or broadcast type—the benefit of a good antenna—and see what I mean!"

SABC Schedules

From Mervyn Laubscher, Johannesburg, South Africa, comes these current schedules of the South African Broadcasting Company, as secured direct from the Engineering Division of SABC:

Transvaal Division, Johannesburg—3.450, in Afrikaans, 11:10 a.m.-4:05 p.m. (Saturdays to 4:45 p.m.); *English* news at 12:30 p.m. (except Sundays) and 3:45 p.m. (BBC); on Fridays, carries *English* programs, 1-4:05 p.m., with *English* news at 3 p.m. The 4.895 frequency is not operating. 6.007, 11:45 p.m.-1:30 a.m. (Sundays, 12:55-1:10 a.m.), and 9-11 a.m.; *English* news at 1 a.m. (BBC). 9.523, 3:15-7:10 a.m. (Sundays, to 9 a.m.); *English* news at 6:15 a.m. The 11.710 frequency is not operating. (Foregoing is Johannesburg No. 3 with 5 kw. power.) 6.095, 11:45 p.m.-1:30 a.m. (Sundays, 12:55-1:10 a.m.), and 9 a.m.-4:05 p.m. (Saturdays, to 4:45 p.m.); *English* news, 12 midnight (except Sundays), 1 a.m. (BBC), 11 a.m. (BBC), 12:30 p.m. (except Sundays), 3 p.m., and 3:45 p.m. (BBC); on Fridays, carries Afrikaans program from 1-4:05 p.m., with no *English* news at 3 p.m. 9.912, 3:15-7:10 a.m. (Sundays, to 9 a.m.); *English* news, 6:15 a.m. (Foregoing is Johannesburg No. 4 with 1 kw. power.) 4.373, 11:45 p.m.-1:30 a.m. (Sundays, 12:55-1:10 a.m.), 3:15-7:10 a.m., and 9 a.m.-4:05 p.m. (Sundays, 3:15 a.m.-

4:05 p.m., Saturdays, to 4:45 p.m.); *English* news, 12 midnight (except Sunday), 1 a.m. (BBC), 6:15 a.m., 11 a.m. (BBC), 12:30 p.m. (except Sundays), 3 p.m., and 3:45 p.m. (BBC); on Fridays, carries Afrikaans programs from 1-4:05 p.m. with no *English* news at 3 p.m. (Foregoing is Johannesburg No. 5 with 0.2 kw.)

Cape Division, Cape Town—5.88, 11:45 p.m.-1:30 a.m. (Sundays, 12:55-1:10 a.m.), and 11 a.m.-4:05 p.m. (Saturdays to 4:45 p.m.); *English* news at 1 a.m. (BBC), 12:30 p.m. (except Sundays), and 3:45 p.m. (BBC); on Wednesdays, carries *English* programs from 1-4:05 p.m. with *English* news at 3 p.m. 9.61, 3:15-7:10 a.m. and 9-10:30 a.m. (Sundays, 3:15-10:30 a.m.); *English* news, 6:15 a.m. (This is Cape Town No. 3 with 5 kw. power.)

Natal Division, Pietermaritzburg—4.878, 11:45 p.m.-1:30 a.m. (has no program on Sunday), and 3:30-7:10 a.m. (Mondays, Wednesdays, and Fridays, from 3 a.m.), and 9 a.m.-4:05 a.m. (Sundays, 2:15 a.m.-4:05 p.m., and Saturdays, to 4:45 p.m.); *English* news at 12 midnight (except Sundays), 1 a.m. (BBC), except Sundays, 6:15 a.m., 11 a.m. (BBC), 12:30 p.m. (except Sundays), 3:05 p.m., and 3:45 p.m. (BBC); on Mondays, carries Afrikaans program, 1-3 p.m. (This is Pietermaritzburg No. 2, using 0.5 kw.)

Mr. Laubscher comments that the SABC emphasized that call-signs are no longer used by the SABC and that identification is given in *English* and Afrikaans at sign-on and sign-off of each transmission.

He sent along a fine list of stations he's receiving in Johannesburg, including HER5, ZFY; XQP, 7.285, Lusaka, Northern Rhodesia, heard at 4 a.m. on

(Continued on page 104)

FCC REGULATIONS REGARDING LICENSING OF TWO-WAY RADIO

(This is published in reply to the many letters received by Radio News as a result of Comdr. S. Freedman's article "Two-Way Radio for Everyone" which appeared in the September, 1946 issue.)

T. J. Slowie, Secretary of the Federal Communications Commission, sends the following information regarding the operation of two-way radio equipment and the licensing regulations that apply to the various types of operation.

Order No. 133, dated June 1, 1946, specifies that subject to the conditions stated below, the provisions contained in Section 318 of the Communications Act of 1934, as amended, are waived, insofar as such provisions require any person to hold an operator's license in order to operate the various classes of mobile or portable transmitting apparatus authorized for use in Emergency, Miscellaneous, Railroad and Experimental Services (Parts 5, 10, 11, and 16 of the Commission's rules). These conditions are: 1. The terms of this order **DO NOT APPLY** to any portable or mobile station using radiotelegraphy employing manual operation; 2. The terms of the order do not apply to any portable or mobile station operating on frequencies below 25 megacycles unless such operation is subject to control by a licensed operator of the associated land station operated by the same licensee; 3. The terms of the order do not apply to any portable or mobile station in the experimental service looking to common carrier operation on a regular basis other than in the General Mobile Radio Service and 4. The terms of this order shall not be construed to authorize any person not holding a proper operator license issued by this Commission to make adjustments to any radio transmitter.

Order No. 133 does not in any manner apply to the amateur service and does not waive the requirement of operators' licenses for the operation of all amateur transmitters. All operators of amateur transmitting stations must be licensed regardless of the frequency used.

In all instances, don't forget that your best bet before operating any radio transmitting equipment, mobile, portable, stationary, experimental, etc. is to get in touch with your nearest FCC Field Office.

OUR LATEST SPECIALS FOR SERVICEMEN, AMATEURS, AND EXPERIMENTERS!

POWER TRANSFORMERS—Ideal for radio construction or replacement. Primary—110V, 60 Cycle. Filament and high-voltage windings are center-tapped. Specify whether 6.3 or 2.5 V is wanted.

For 5-6 tube sets: 650V, 45MA; 5V fil. and either 6.3 or 2.5V fil. **\$1.75**

For 6-7 tube sets: 675V, 50MA; 5V fil. and either 6.3 or 2.5V fil. **1.90**

For 7-8 tube sets: 700V, 70MA; 5V fil. and either 6.3 or two 2.5V fil. **2.35**

For 9-15 tube sets: 800V, 150MA; 5V fil. and a 6.3V fil. only **2.95**

5V, 10Amps—\$1.98, 6.3V, 8Amps—\$1.98; 2.5V, 25Amps and 6.3V, 3Amps **2.25**

AUTO-TRANSFORMERS—May be used on 90 to 250 volts for step-up or step-down applications. Up to 300 Watt capacity **1.95**

FILTER CHOKES—200, 300, 400, or 500 ohms—Heavy duty—95c; Midget type—59c; 250MA, 35 ohms DC—Fully shielded in black crackle case, only—\$1.95. **AUDIO TRANSFORMERS:**

Single plate to single grid 3:1—79c; Single plate to P.P. grids—79c; Heavy duty, class "AB" or "B" P.P. inputs—\$1.49c; Midget output, for AC-DC sets—69c. **UNIVERSAL**

OUTPUT TRANSFORMER—tapped for various impedances—95c; **MIKE TRANSFORMER**—Single or double button—79c. High fidelity MIDGET MIKE to grid transformer, similar to UTC oncer units **\$3.00**

TUBES—A Warehouse Full of Them!—Order all types needed, not just the critical types, and we'll do our best to supply you completely!

SELENIUM RECTIFIERS—Dry disc type, 1½" by 1", 1.2 Amp. maximum, suitable for converting DC relays to AC, for supplying filament source in portable radios, converting DC meters to AC applications, and also may be used in low current charges **99c**

TRIPLETT METER RECTIFIERS—Full wave, may be used for replacement, or in construction of all types of test equipment **\$1.25**

E-Z WIRE STRIPPERS—Cleans insulation from solid or stranded wire swiftly, neatly, and without damaging wire. A real time saver. Standard model—\$3.95; Automatic model—Stays open after grip is relaxed until wire is removed . . . **\$4.95**

SILVERTONE CABINETS—Walnut finish—excellent replacement cabinets—Model 1923, 11x18x20; Model 4465, 15x10x8; and Model 4619, 9x10x16½. Each **\$1.50**

FIRESTONE PORTABLE CABINETS—Two tone, leatherette covered carrying cases, sloping dial—Ideal for rejuvenating banged-up portables **\$3.95**

PHONO CABINETS—With speaker grille—\$7.75; Without—\$8.50. Both types leatherette covered with well designed grips and hardware.

PORTABLE AIR COMPRESSOR—Attaches to ¼ H.P. motor. Just the thing for refinishing radios, painting cars, blowing out chassis, etc. 100 lb. gauge and syphon type gun with 12 feet of rubber hose included. Pressure adjustable to stay constant at any pressure up to 100 lbs. **\$21.50**

RECORD CHANGERS—These are beauties—two post, with featherweight plastic and chrome pick-up, plays 10" and 12" records intermixed! Complete with blue leatherette, mahogany or walnut stained cabinet, your choice. Ready for attachment to any radio at the give-away price of only **\$24.95**

CRYSTAL PHONO PICK-UP—Latest design. Features needle pressure compensation to reduce record wear. Excellent replacement for any record player **\$2.75**

110V, 60 cycle phono motor & table **5.95**

Motor and Crystal Pickup together **7.95**

RADIO HANDBOOK—Published by Editors and Engineers 1.95

PLIERS KIT: Khaki Case with 4 Alloy Steel pliers of different designs. Flat-nosed, pointed-nose, adjustable parrot-nose, and adjustable slip-joint. Brand New—Complete **\$2.08**

PORTABLE AIR COMPRESSOR: Attaches to ¼ H.P. motor. Just the thing for refinishing radios, painting cars, blowing out chassis, etc. Pressure tank, 100 lb. gauge and syphon type spraygun with 12 feet of rubber hose included. Pressure adjustable to stay constant at any pressure up to 100 lbs. Net price, postage included **\$22.25**

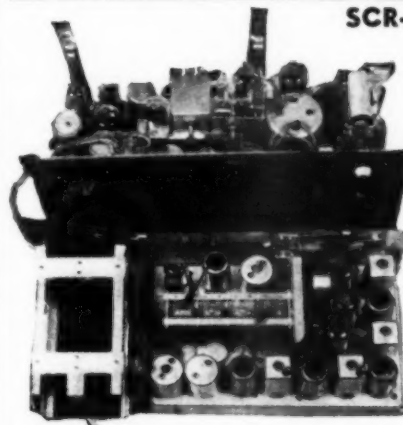
MICROPHONES—Bullet crystal mike—Only \$5.45; Bullet dynamic mike—\$7.45; Both are nationally advertised brands and sold elsewhere at much higher prices. SHURE 7-17 single button mike, made for Signal Corps, has press-to-talk switch in handle, and is complete with cord and plug—Only \$2.75! Midget Mike—Made for Signal Corps. Single button type, with stretched duraluminum diaphragm. Gold plated finish. This unit makes an excellent lapel mike, or concealed pick-up. Specially priced at **95c**

CONDENSERS—Guaranteed one year! Priced in lots of ten or more, either one type or assorted. 50mfd. 150v—53c; 25mfd. 35v—23c; 20-30mfd. 150v—46c; 20-20mfd. 150v—35c; 20mfd. 150v—23c; 10mfd. 450v—32c; 10mfd. 35v—23c; 8-8mfd. 475v—65c; 8mfd. 450v—45c; 8mfd. 200v—20c. **PAPER CONDENSERS**—600 W.V., 25mfd.—23c; 1mfd.—11c; .05mfd.—11c; .02mfd.—9c; .01mfd.—9c; .006mfd.—8c; 5mfd.—36c; 1mfd.—45c; Screwneck aluminum can type—10mfd.—600P.V.—85c; 10mfd.—550 P.V.—65c; Mica condensers—any size—5c or 100 Micamold assorted for **59c**

RELAYS—Sigma No. 4RJ—2000 ohm, SPDT—May be adjusted to operate on less than one milliamperes! Ideal for photo-electric and electronic control circuits. Regular price \$8.50, now only \$2.50; **GUARDIAN SPST RELAY**—12 to 24 volts. Has 400 ohm, center-tapped coil for operation in balanced current circuits if desired—\$1.25; **GUARDIAN V-make**, 1-break, 12 to 24 volts—\$1.00 each, or 5 for \$3.75; **SPST**, normally open, works on AC or DC, only—65c; 4-pole (3-make, 1-break), 400 ohm, AC or DC, excellent for plate circuit of tube, photo-cell amplifiers, etc. **\$1.75**

BENDIX SCR-522—Very High Frequency Voice Transmitter-Receiver—100 to 156 MC. THIS JOB WAS GOOD ENOUGH FOR THE JOINT COMMAND TO MAKE IT STANDARD EQUIPMENT IN EVERYTHING THAT FLEW, EVEN THOUGH EACH SET COST THE GOVT. \$2500.00. Crystal Controlled and Amplitude Modulated—High Transmitter Output and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has 10 tubes and transmitter 7 tubes, including 2-832's. Furnished complete with 17 tubes and power supply for 12 or 24 volts, also remote control boxes, cable connectors and antenna. We include complete diagrams and instructions for the simple conversion of the 522 to full 110 Volt 60 Cycle operation. Your cost **\$75.00**

General Electric RT-1248 15 tube transmitter-receiver with TERRIFIC POWER (20 Watts) on any 2 instantly selected, easily pre-adjusted frequencies from 435 to 500 Megacycles. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 955's as first detector and oscillator, and 3-7H7's as IF's, with 4 slug-tuned 40 MC. IF transformers, plus a 7H7, 7E6's, and 7F7's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 Volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for telephone use as in a taxicab, or for any kind of remote control applications as with drone airplanes. Instructions and diagrams supplied for running the 1248 transmitter on either code or voice, and for using the receiver as either an AM or FM set. As an FM set, the receiver section of the 1248 is capable of better results than almost any of the commercial FM sets on the market, largely as a result of the superb engineering and meticulous workmanship employed in constructing the converter, oscillator and IF sections. Supplied in original factory packing with 15 tubes. Your cost \$29.95—10% less if ordered in lots of 2 or more.



SCR-284 Transmitter-Receiver

Made to be used in Army jeeps and trucks, as well as in the field, or as a headquarters set, the SCR-284 is particularly adaptable for all amateur, experimental, marine, aircraft, police, and mobile applications.

The receiver is a 7-tube superheterodyne, featuring an RF stage, four double-tuned 455 KC iron-core IF transformers, two audio stages, a beat frequency oscillator for CW reception, and is powerful enough to operate a large size speaker. The transmitter employs a calibrated crystal oscillator, a buffer amplifier, and a pair of RK-75 tubes in the final amplifier stage. The speech amplifier and modulator will operate with any ordinary mike, or for \$2.75, we can include a Signal Corps mike, complete with "press to talk" switch. A built-in antenna tuning circuit, including an RF ammeter, will match the transmitter to any length of antenna. The transmitter plates are supplied by a 500 volt, 160 MA dynamotor which operates from either a 6 or 12 volt automobile battery. The transmitter output is 25 watts, and operates on both phone and CW. The frequency range is 3760-5825 KC. Operation on other bands may be facilitated by the use of plug-in coils. Circuit diagrams and operating instructions are furnished.

These sets are specially priced at \$29.95 complete with set of 13 tubes and crystal. The dynamotor, which must be used, if it is not desired to use 110V AC, is \$15 additional. Where a compact and dependable medium power unit is desired, this set is unbeatable!

14-Tube UHF Superheterodyne Receiver—\$39.95

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Ohms: 0-1000/200,000/2,000,000

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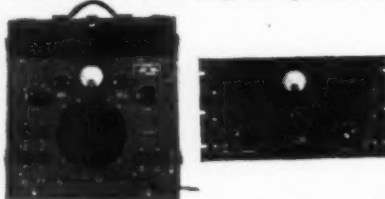
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Are You Qualified?

By C. H. PARKER

FOR many years there has been a problem facing the radio service technicians of this nation even though the majority of those working in the trade are unaware of this fact.

This problem takes the general form of ratings and classifications for those men who are working in the radio service trade. Just how good is a radio serviceman? The radio technician himself and the radio dealer who might hire the technician is vitally interested in knowing what are his capabilities.

Up to this time, no means have been developed to determine whether a radio serviceman is a learner or an apprentice, or whether he is a bona fide journeyman and deserving a journeyman's rate of pay. If he is an apprentice, how much training will be necessary to qualify him for full journeyman's rating? With this as the objective, the trade test for the classification of the radio technician and the training program for the upgrading was developed.

The development of a trade test that will be a true "yard stick" of a technician's abilities is by no means a simple matter. In order to make it valid, contributions and suggestions were requested from the leading radio technicians in San Diego. When the tentative program was outlined to these people, they gave it their wholehearted support. This proved we were on the right track and that some sort of a testing program was needed in the trade.

The questions which came in from the contributors were added to our own. These were written up into the first sample test and submitted to a committee, composed mostly of those making the contributions. Each question was discussed by the group for wording, its practical application and technical content. One thought uppermost in the construction of the test was to keep it practical. Most of the tests compiled in the past have dwelt too much on theory and not enough on practice.

After the test was written up in its final form, it was taken by each member who served on the committee. The time required to complete the test ranged from one hour and fifteen minutes to one hour and a half. This, then, represented the length of time that it should require a journeyman to complete the test. From the above figures, the time limit of one hour and a half was set for the test. The time devoted to the compiling of the test has been well justified, as to date, there have been no complaints from those taking it that it is unfair or biased in any manner. Being administered by a public school removes all taint of favoritism, whether the radioman is a newcomer from out of town, or whether he is an old timer in the community. With such a program under way, the future began to look very optimistic. Only one thing now darkened the horizon. At this time, there was no organization in San Diego for the radio service technician. The dealers have had for several years, a very active organization known as the "Bureau of Radio and Electrical Appli-

ances" which includes all of San Diego County. Of the several technician organizations that had existed at various times, none were active. In fact, it had been about four years since the last organization functioned. Now the need for organization is imminent. At this time, the "Electronics Division of the Bureau of Radio and Electrical Appliances" was organized. Mr. J. Clark Chamberlain, Secretary of the "Bureau," gave invaluable assistance in the organization of the "Electronics Division." This new organization is open to anyone who is interested in radio from the technical standpoint. This seems to be a very practical and logical set-up for the radio technician. In the past, most of the failures of technician groups everywhere were due to the lack of a solid foundation on which to build their organization.

In the regular training program of the San Diego Vocational School, the trade test has proved very useful as a means of evaluating past experience and deciding at just what training level the trainee should enter. It is also used to check the students who have completed the course. It gives them an unbiased evaluation of their abilities, compared to the competition in the trade.

As a result of testing several score technicians, a real need was revealed for a training program for the man working in the field in order for him to qualify for a journeyman's rating. This resulted in the organization of a Trade Extension Radio Class, which meets two nights per week. A few topics from the course content are listed here: A.F. Amplifiers, Measurements and Performance Testing, Analysis of Tone Controls and Compensation, Impedance and Speaker Matching, R.F. Amplifiers, Analysis of Tuned Circuits, A.V.C. and A.F.C., Oscillators, Current Distribution in Vacuum Tube Circuits, Use of Special Testing Equipment, Frequency Modulation, Analysis, Service and Alignment Problems, Special Type Antennas, Intercommunication Equipment, Practical Acoustics, etc.

The problem of how to get the returning service man back into civilian life and placed in suitable jobs is an acute one in San Diego, as it is in all centers of military and naval activity. Surveys have shown that there are more than twice as many men interested in getting into radio and related electronic fields as in the second most popular trade, refrigeration. If all of the men who declared an interest in radio were encouraged to enter this field, there would not be enough corners in the cities to accommodate their shops; and business failures would reach an unfortunate peak.

Many men who were in radio or some other branch of electronics before the war, or had extensive training in the Armed Forces are well prepared to take up the operation of their own shop, or to work for one of the established dealers. No effort is spared to help these men who are really qualified to get into good jobs. The real problem is to be able to distinguish between the competent men and the "would be's."

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Fortunately, this condition was foreseen far enough in advance to permit us to establish a suitable Radio Trade Test and to standardize the scores before the real influx of discharged men came in for counseling. It has been possible to help a great many men get good jobs on the strength of their grade in the trade test, and, what is probably even more important, a great many men have been prevented from getting into this very highly competitive trade before they had the training and experience required to stay in it and succeed.

Very few men who have been tested have disagreed with the soundness of the conclusions reached. Each man's score is posted on a graph, showing the relative technical ability of the total of the men with whom he is to compete, and gives him an exact idea as to his present qualifications. The scope of this test is so broad that it is easy to point out to each individual just where his strength and weaknesses are, and how best to prepare himself for a really successful career in radio.

The radio dealers and employers have been quick to take advantage of this as a means of checking the qualifications of their prospective technicians. Most shop owners and managers are willing to pay good wages to men they know are really qualified but they have no other means at their disposal for quickly determining a man's real value technically except the costly method of trial and error.

The San Diego shops are making a practice of asking for a Trade Test Grade Card, when a new man applies for work. In following this procedure, advantages are had by both parties; first, the applicant is able to show without any doubt, that he is qualified to handle radio repair and service work; and second, the employer can pass on the individual's personal qualifications without the confusion and worry caused by so many "experts" representing themselves above their real ability.

Inasmuch as all testing is done at the San Diego Vocational School, which is part of the regular city school system, and not connected with any dealers, manufacturer or labor organization, all parties to the testing procedure feel assured there is no partiality or politics involved and that all information is strictly confidential.

Scores in the Trade Test are made meaningful by keeping a graph up-to-date showing the relative percentage achieved by each applicant. A sheet is marked off in percentages from 100 to 0, and as each test is graded, the result is checked on the graph. It is thus possible for any man to quickly check his ability and experience relative to all others in the community.

This testing procedure has had a very good and wholesome effect on the technicians themselves. Probably one of the main reasons for the success so far achieved is that the material for the test came from the work shops themselves and that there is no compulsion or coercion involved. The men are using this method of improving their own trade.

The success of the program is insured by the cooperation of both the service dealers and radio technicians working together through the Vocational School for their mutual benefit.

—30—

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PRESENTING: A new line of volt-ohm-milliammeters of the highest quality, and at a price that is destined to make radio history! The EMC line of VOLO-

EMC

Model 100

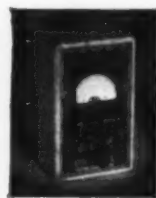
METERS are rugged, flexible instruments manufactured to the highest standards of quality and precision, and yet they sell for a price that can't even be approached by com-



EMC

Model 101-B

petitors unless quality is sacrificed or features are eliminated. Want proof?



SPECIAL FEATURES: Unusually wide resistance ranges. AC volts from 25 cycles to one megacycle with no temperature error. Battery and rectifier replaceable.

SPECIFICATIONS: Model 100 (top left) 6 AC-DC voltage ranges, (1000 ohms per volt). 0 to 3-12-60-300-1200-6000 volts. 4 DC current ranges, and 3 resistance ranges, 1/4 ohm to 30 megohms. Open face (shown) \$21.95.

MODEL 101-B (center) 4 1/2 inch meter. 4 resistance ranges, 1/20th ohm to 20 megohms. 5 AC-DC voltage ranges and 3 DC current ranges. Open face (shown) \$20.95. Portable model \$24.95.

MODEL 101-A (bottom left) Same as Model 101-B in every respect, except that this model is equipped with a 3 inch meter. Open face (shown) \$17.50. See Your Jobber

ELECTRONIC MEASUREMENTS CORP.
114 Liberty St., New York 6, N. Y.

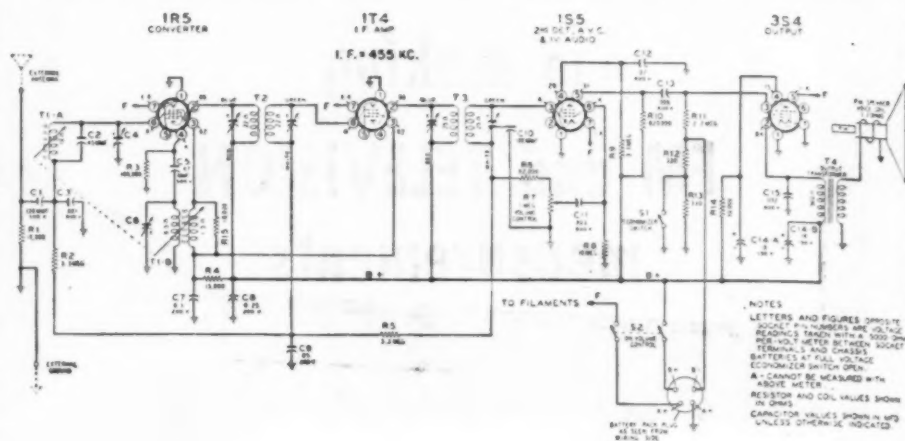


CIRCUIT PAGE

(FOR PARTS LISTS SEE PAGE 70)

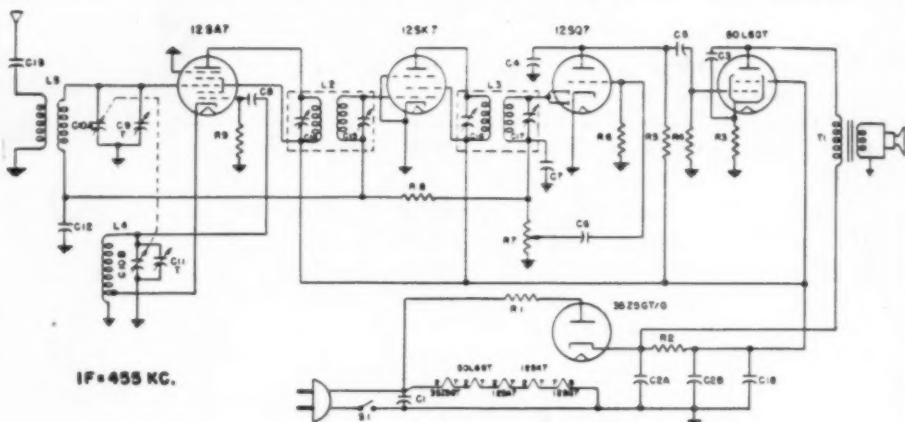
RADIO NEWS, DECEMBER, 1946

WARD MODELS 64BR-1205A, 1206A



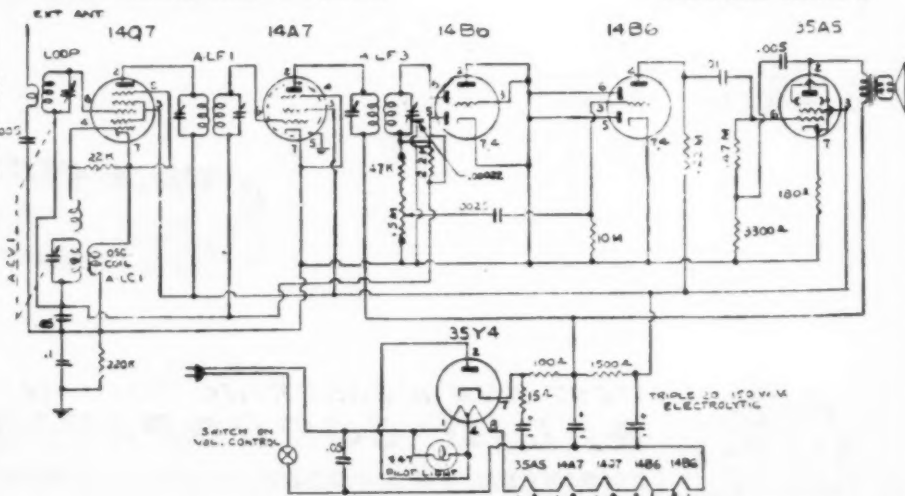
RADIO NEWS, DECEMBER, 1946

GENERAL ELECTRIC MODELS YRB60-1, YRB60-2



RADIO NEWS, DECEMBER, 1946

TELEPHONE SERIES D

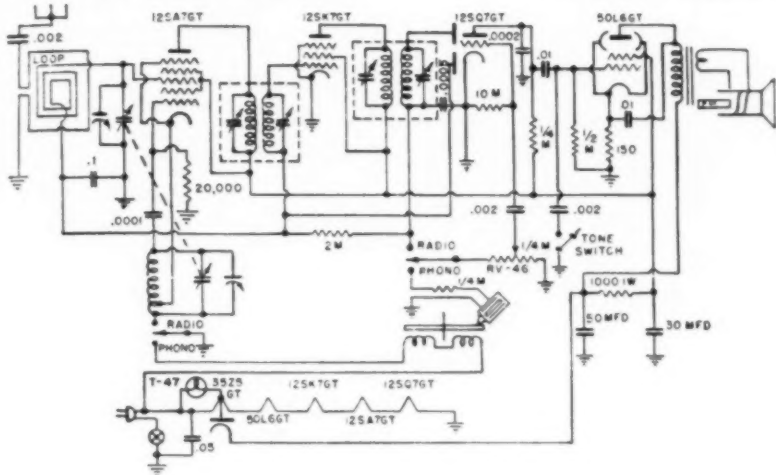


RADIO NEWS

Here, and on following pages, are circuit diagrams and parts lists of many new postwar radio receivers. Radio News will bring to you other circuits as quickly as possible after we receive them from manufacturers.

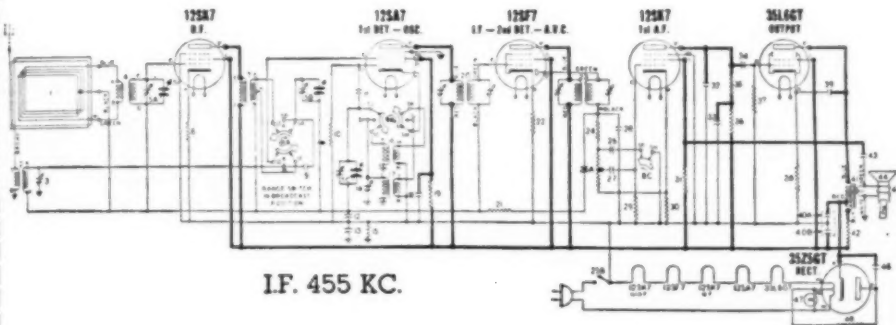
RADIO NEWS, DECEMBER, 1946

AUTOMATIC MODEL 640



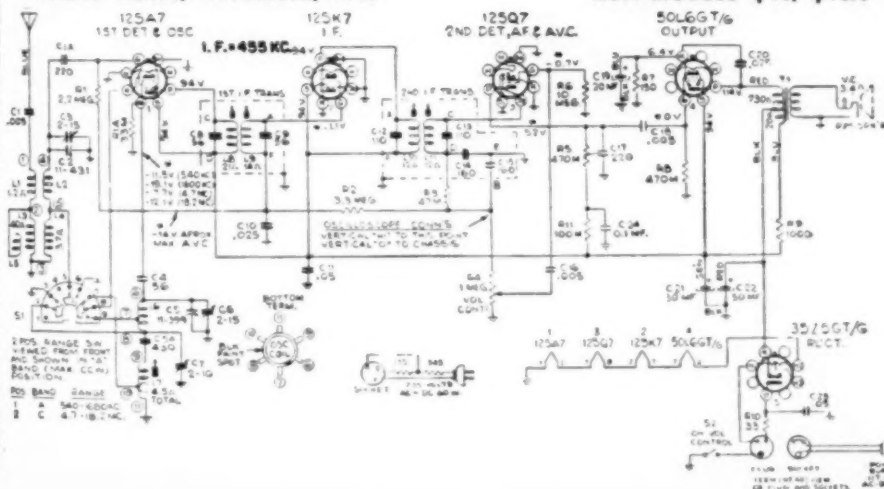
RADIO NEWS, DECEMBER, 1946

STEWART-WARNER MODEL 9000-B



RADIO NEWS, DECEMBER, 1946

RCA MODELS Q10, Q10A



**Attention
GI JOE!**

Here's Your Opportunity to be First to

Start Your Own RADIO SERVICE SHOP

Complete Starting-in-Business
Package Stocks of

TEST EQUIPMENT
TUBES, PARTS, TOOLS

\$350 up

Act quickly! Meet the pent up demand for radio service. Turn your special service training into a profitable business of your own. No fuss. No worry. Here's everything you need—\$350 up. Details upon request! Write, wire or phone

TRIPLETT 666

"POCKET" VOM **\$15.25**

A.C.-D.C. Volts
0-10-50-250-1000
0-100-500 D.C. Milli
0-300-250000 Ohms
Size 3 1/2 x 2



TRIPLETT 666H

\$20.00

Same as above plus
5000 V. ranges

Triplett 650SC Output Meter

Regular **\$24.50**

Special **\$16.50**

0-1.5-6-15-60-150 Volts, 4000 OHM Impedance.

3" Meter 100 Microamp movement

Triplett 606B .. Regular \$16.67

Voltage & Polarity Tester, Special \$11.95

Ideal for plant maintenance work! Checks 115-220-440 line at a glance! Indicates AC or DC visually! Indicates DC Polarity visually!

HALLICRAFTERS S-38



\$39.50

S-40 (replaces

S20R)

\$79.50

HAMMARLUND-HQ129X \$168

Speaker for HQ129X \$10.50

THE DEFIANT! \$83.95 Complete

25 Watt Sound System, wired, ready to use!



A reliable amplifier with 2 mike and 1 phono inputs, two 12" 20 oz. 13 watt PM speakers with 25' cables, two 12" walnut 7 ply wall baffles; one crystal microphone with table stand and 15' shielded cable.

THE CHALLENGER! \$69.95 Complete

25 Watt Sound System

Same as above except includes one speaker and baffle.

PHILCO BEAM OF LIGHT

Selenium Cell only, no holder **1.90**

20% deposit required on all C.O.D. orders. 2% transportation allowance on orders of \$25.00 or more accompanied by payment in full.

Write for
FREE CATALOG

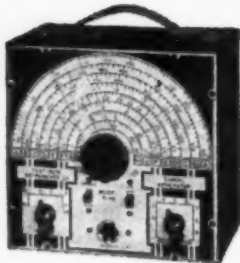
**RADIO SUPPLY &
ENGINEERING CO., Inc.**
129 SELDEN AVE. DETROIT 1, MICH.

METROPOLITAN

Guarantees Delivery From Stock!

B-45 SIGNAL GENERATOR

for
Servicing
AM
FM
Television
Receivers



Self-modulated Signal Generator, providing a highly stable signal. Generates R.F. frequencies from 150 Kilocycles to 50 Megacycles (150 Kc. to 12.5 Mc. on Fundamentals and from 11 Mc. to 50 Mc. on Harmonics). R.F. is obtainable separately or modulated by the Audio Frequency.

Television and F.M. as well as A.M. receivers can now be speedily aligned. Modulation in the B-45 is accomplished by Grid-blocking action which has proven to be equally effective for alignment of amplitude and frequency modulation as well as for television receivers.

The R.F. Signal Frequency is kept completely constant at all output levels. This is accomplished by use of a special grid loaded circuit which provides a constant load on the oscillatory circuit. A grounded plate oscillator is used for additional frequency stability. The Model B-45 is truly portable—no external source of current required. Operates on self-contained batteries.

Direct reading—all calibrations are etched on the front panel. Complete with shielded test lead, self-contained batteries and instructions.
Net **\$27.75**



New Model 670 SUPERIOR SUPER-METER

A Combination Volt-Ohm milliammeter plus capacity reactance inductance and decibel measurements
NET **\$28.40**



New Model 450 SUPERIOR TUBE TESTER

"Speedy Operation" assured by newly designed rotary selector switch which replaces the usual snap toggle or lever action switches.
NET **\$39.50**

McMurdo Silver 905 "Spark" Signal Tracer	\$39.90
McMurdo Silver 904 Capacitance Resistance Bridge	\$49.90
McMurdo Silver "Vomax"	\$59.85
Supreme 543 Multi Tester	\$18.95
Supreme 565 Vacuum-Tube-Voltmeter	\$63.50
Supreme 576 Signal Generator	\$68.95
Superior CA-II Signal Tracer	\$18.75
Superior 650 Signal Generator	\$48.75
Superior 400 Electronic Multi-Meter	\$52.50
Superior 600 Comb. Tube & Set Tester	\$62.50
R.C.P. 664 Electronic Voltmeter	\$45.00
R.C.P. 705 Signal Generator	\$49.50
R.C.P. 802N Comb. Tube & Set Tester	\$59.50
Monitor Crystalline Signal Generator	\$57.50
Waterman "Pocket Size" Oscilloscope	\$35.00
Dumont Five-Inch Oscilloscope	\$99.50

Write for FREE New 1947 Catalog!

METROPOLITAN
ELECTRONIC & INSTRUMENT CO.

6 MURRAY ST.

NEW YORK 7, N. Y.

What's New in Radio

NEW UTILIPHONE

Production of a new deluxe model Utiliphone for office use has been announced by *Electronic Laboratories, Inc.* of Indianapolis.

This unit, which provides a two-way intercommunication system for busi-



ness firms, consists of two speaker units, both of which are controlled by a push-button so that either speaker may be turned on or off at will. This is accomplished by means of a three-way wire connection.

Prices and further information on the deluxe model Utiliphone will be furnished by *Electronic Laboratories, Inc.*, Indianapolis, Indiana.

N.U. TABLE RECEIVER

National Union Radio Corporation has announced the availability of the first of their new line of home receivers which the company will market through their regular distributors.

The "Presentation Model," G-619, the first of the receivers to be on the market, is a 6 tube, a.c.-d.c. radio housed in a mahogany toned, all wood cabinet. The receiver employs a tuned r.f. superheterodyne circuit with



broadcast band tuning and full-vision slide rule dial scale.

This receiver is being manufactured by the *National Union Radio Corporation*, of Newark, New Jersey.

RESISTOR CHESTS

Olson Radio Warehouse of Akron, Ohio is currently offering a resistor assortment which is housed in a sturdy, walnut finished wood chest.

The chest which measures 9 1/4" x 6 1/4" x 3" has a removable tray. One hundred insulated resistors are housed in the 20 compartments in the chest. The resistance ranges covered

in the assortment include sizes from 5 ohms to 20 megohms, 1/2 w. to 2 w.

Also included with the chest and resistors is a "Resist-O-Guide" for the easy identification of color coding on any resistor, although the resistors included in the chest are stamped with both resistance value and color code.

Olson Radio Warehouse, 73 East Mill Street, Akron 8, Ohio, will gladly furnish prices and further information on this resistor chest.

ELECTRONIC VOLT-OHMMETER

The Specialty Division of *General Electric Company's* Electronics Department has recently announced a new electronic volt-ohmmeter, Type PM-17.

The new instrument which was developed and designed for general service and laboratory work, is capable of measuring audio and r.f. voltages at frequencies from 60 cycles to over 100 megacycles.

According to company engineers, the high input impedance and simple controls permit measurements to be



made without appreciably disturbing the existing circuit under test.

The PM-17 weighs 15 pounds and operates from 105 to 120 volts, 60 cycles. The ohmmeter circuit is included for convenience in measuring high and low values of resistance.

Further information on the PM-17 electronic volt-ohmmeter is available on request to the Specialty Division of *General Electric Company's* Electronics Department, Wolf Street Plant, Syracuse, New York.

PLUG-IN TRANSFORMERS

Newcomb Audio Products Company of Los Angeles has announced that all amplifiers built by the company are featuring a socket for each microphone channel into which may be plugged the newly-designed *Newcomb* plug-in transformers. These transformers are triple alloys, shielded to eliminate hum.

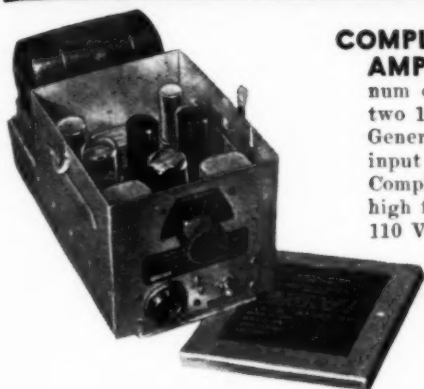
The manufacturer claims that this type of transformer application, in the amplifier proper, provides several distinct advantages, including; instantaneous conversion from high to low impedance without cutting, soldering or rewiring; the possibility of using

RADIO NEWS

WAR SURPLUS EQUIPMENT!

At A Fraction of Their Original Government Cost!

SUN RADIO The Home Of Nationally Known Radio Parts

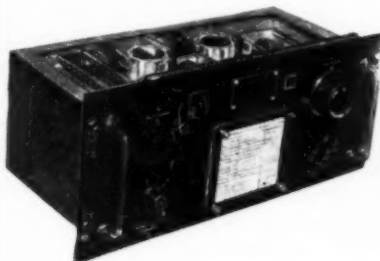


COMPLETE 4 TUBE INTERPHONE AMPLIFIER Comes in an aluminum cabinet $9\frac{1}{4} \times 4\frac{3}{4} \times 5\frac{1}{2}$ inches with two 12J5GT tubes and two 12A6 also General Electric Dynamotor 28DC Volt input and 250 VDC output at 60 MA. Complete instructions and diagram for high fidelity phonograph or speech for 110 Volt operation. This is the greatest offering made in War Surplus Electronics. **\$8.95**
Yours for only

J-B-T VIBRATING REED FREQUENCY METER



Range 56 to 64 C.P.S. with eleven reeds. Regular net price, \$24.75. Your cost only **\$9.95**



TUNING UNIT This "RF" tuning unit designed and manufactured for the United States Army to their rigid specifications is offered at a fraction of their original cost. . . . Guaranteed in excellent condition **\$3.89**
less tubes

No. TU5B, 1500 to 3000 KC
No. TU6B, 3000 to 4500 KC
No. TU7B, 4500 to 6200 KC
No. TU8B, 6200 to 7700 KC
No. TU10B, 10,000 to 12,500 KC

Please specify model

WE CAN FURNISH FROM STOCK

SUBJECT TO PRIOR SALE

Waterman Pocket Oscilloscope	\$55.00
Approved Electronic Signal Generator	\$47.00
Receiver BC 344, 150 to KC. Complete with L3 Speaker	\$85.60
BC683-684 F. M. Transmitter and Receiver, 27 to 38.9 MC.	\$69.95
BC1068A Radar, 174 to 212 MC	\$39.95
SCR 195 Walkie Talkie, ready to operate. Set of 2	\$119.90
200 Feet of No. 14 Copper Weld Wire	\$2.50
50 Feet of Heavy Twinx Lead, 72 ohm, good up to 2KW	\$2.50

ATTENTION!

Amateurs, Service Men and Experimenters in the Washington D.C. area!

It will pay you to visit our new enlarged parts section where you'll find hundreds of bargains in radio surplus which we cannot advertise because the quantities are too small. Stop by! . . . It will be worth your while!!!

All items F. O. B. Washington, D. C.
All orders \$30.00 or less cash with order.
Above \$30.00, 25 percent with order, balance C. O. D.
Foreign orders cash with all orders plus exchange rate.

SUN RADIO

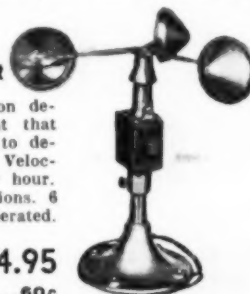
OF WASHINGTON, D. C.

938 F STREET, N. W. WASH. 4, D. C.



NEW 1946 MODEL 25 WATT AUDIO AMPLIFIER Three input channels employing a new circuit and the latest type tubes. Designed to give you the best. Output universal will match either Voice, coil or 500 ohm line, 110 Volt AC operation. Complete as pictured with 3-7C7, 1-7N7, 2-6L6, 1-5U4G tubes, tone control. **\$57.39**
List price \$95.65, your cost

NAVY ANEMOMETER



Beautiful precision designed instrument that will enable you to determine the Wind Velocity in miles per hour. Complete instructions. 6 Volt battery operated. Brand new. Less Battery **\$14.95**
Battery 60c



NEW COLLINS AIRCRAFT TRANSMITTER
The Popular Transmitter of Today

Channels .2 to 18.1 MC up to 90 Watts output. Furnished with two antenna loading units, one control box, one antenna shunt, and dynamotor with tubes. Write today for our special price and conversion data.



NAVY V.H.F. RADIO TRANSMITTER

Less Batteries
\$14.95

Battery operated (67½ V.B. and 1½ V.A.). Frequency 80 to 105 MC Complete with 2-1G4 tubes and full instruction manual
BRAND NEW

HARRISON HAS IT!—

RECHARGABLE POWER PACK

COMPACT!—only 1 1/2" x 3 1/2" x 4" high (6 1/2" high with battery).

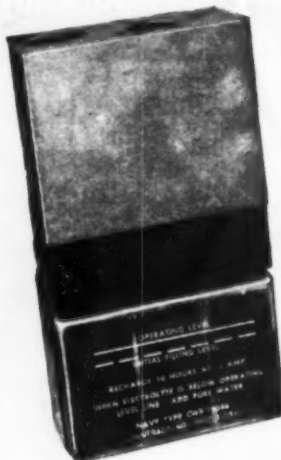
LIGHTWEIGHT!—3lb., 10 oz. Complete!

POWERFUL!—Delivers:

- 135 volts at 20 ma in continuous Military service or 30 ma, or more, in intermittent amateur service.
- 67 1/2 volts at 5 to 8 ma.
- 1.5 filament or 6.3 heater, bias, and microphone voltages.

For little more than the cost of one set of regular dry batteries, you can obtain a new, modern, rechargeable power pack that will save you space, weight, and money! Ruggedly made for Navy radio equipment, this pack gives excellent service under the roughest field conditions.

The vibrator pack has such desirable design features as neon voltage regulator, complete filtering, remote load start relay.



Brand-new, Navy-inspected in original carton with fully charged battery, diagram and instructions. Complete—ready to go.

\$5.50

COAXIAL CABLE

RG-8/U, 52 Ohm Impedance. FB for feeding beams, etc. Handles a KW with high efficiency. New, perfect cables.

110-foot length with two PL-259 coaxial plugs. Total list price **\$4.98** HSS. 65-foot length with one plug. List **\$3.45** HSS. \$22.50.

Cut to size in one piece within -0% to +20% of length ordered. Full measure!

Type	Impedance	O.D.	1-100'	100' and up
RG-8/U	52 Ohms	.405"	9c	6c
RG-11/U	75 Ohms	.405"	10c	7c
RG-13/U	74 Ohms	.420"	14c	10c

RG-58/U, 55 ohms. An efficient, light-weight transmission line (.195" O.D.) for FM, television, and Amateur antennae. Also use as high quality, inexpensive crystal mike or pickup cable. List..... **\$18.50** HSS Special—100 feet for **\$3.95**

CRYSTAL CALIBRATOR AND MONITOR

A very handy piece of new Navy equipment! Use it for tuning ECU or receiver to spot frequencies, monitoring, alignment, checking crystals, etc.

3A1 tube EC Pierce oscillator covers all crystal frequencies. Sockets for 10 crystals, with ceramic selector switch. Phone Jack. Aluminum cabinet 2 1/2" x 4 1/2" x 6" also holds No. 2 cell and a 5540 battery. Complete, with instructions, diagrams, and kit of spare tube and parts, less only batteries **\$4.95** and crystals (With batteries \$5.95)

GOOD-BYE TO BATTERY EXPENSE!!

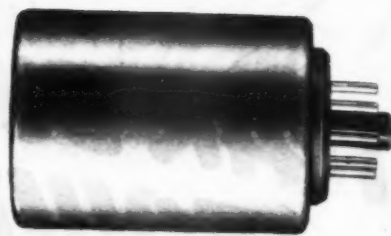
for

- Portable Receivers
- Transmitters
- Walkie Talkies
- Remote Controls
- Test Equipment

Smooth, dependable power comes from a 6-volt storage battery which clips into bottom of pack and which can be recharged over and over again for only a penny or two. Unbreakable plastic NON-SPILL (even if turned upside-down) CASE. Can give over 6 solid hours of continuous operation at full rated load before requiring simple recharge by any half amp. trickle charger or our special inexpensive charger.

BATTERY CHARGER

Noiseless, Selenium rectifier type, to trickle charge these or any other small batteries. 110 Volt AC. **\$2.97**



long lines and the most rugged types of cable; better frequency response regardless of cable length; flexibility of amplifier location without regard to the placing of the microphone, and universal availability.

Complete details of these plug-in transformers will be furnished by Newcomb Audio Products Company, 2815 S. Hill Street, Los Angeles 7, California.

SERVICING TESTER

The Sterling Manufacturing Company has recently introduced a new portable, graphic type of instrument for servicing radios and other electronic equipment.

This tester, according to the manufacturer, simplifies the selection of the desired function and range. The graphic tester is read like a graph. The desired function and range are selected by means of two switches of the graphic selector system. The left, or function switch is set for the type of measurement desired. The lower, or range switch, is set for the range of the type of measurement indicated by the function switch. The adjust-

★ ALL STANDARD LINES

We are Factory Authorized Distributors for the top quality manufacturers and we now have in stock lots more new, latest improved production Ham gear! Visit our stores today, for everything you need. We promise you fresh clean material—quicker—at the lowest current prices—and above all, our sincere desire to be of friendly, helpful service.

As one of the world's largest distributors of Communications Equipment, we are delivering plenty of

RECEIVERS AND TRANSMITTERS

right now! ALL MAKES—practically all models. If you want your new set, test equipment, amplifiers, parts, etc., in the quickest possible time send your order to HARRISON!

RCA 1 KW Modulation Transformers

500 Watt Audio. /: Impedance Ratio 40 Lbs. **\$24.75**

MAIL ORDERS? Certainly! Just list everything you want (items in this ad, or any ad, magazine, or catalog) and include remittance.

Vy 73 de
Bil Harrison, W2AVA

HAM HEADQUARTERS
Since 1925!



HARRISON RADIO CORPORATION

10 WEST BROADWAY • NEW YORK CITY 7

PHONE—BArclay 7-9854 • EXPORT DEPT.—CABLE—"HARRISONRAD"

[JAMAICA BRANCH—172-31 Hillside Ave.—REpublic 9-4102]

CAREERS in RADIO

INTENSIVE COURSES—Thorough, technical education for progressive men and women.

1. **RADIO TECHNICIAN**—The MRI General Course. Includes F.M. & Television. Prepares For FCC Broadcast Licenses.
2. **RADIO & TELEVISION SERVICING**—Prepares for employment as Repairman on Standard Broadcast, F.M. & Television Receivers.
3. **RADIO COMMUNICATIONS**—Prepares for FCC Operators' License. Leads to position as Merchant Marine or Flight Radio Officer; Commercial Operator.
4. **FUNDAMENTAL RADIO MATHEMATICS**—The MRI Preparatory Course. Required pre-training for students lacking a basic mathematical background.

MELVILLE RADIO INSTITUTE
45 W. 45th St., N. Y. 19, BR 9-5080

"The Radio School Managed By Radio Men"

Licensed by the State of New York

MELVILLE RADIO INSTITUTE

45 West 45th St., New York 19, N. Y.

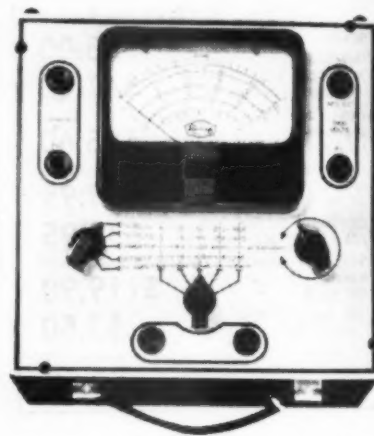
GENTLEMEN:

Send me FREE information about your school.

Name.....

Address.....

MAIL THIS COUPON NOW



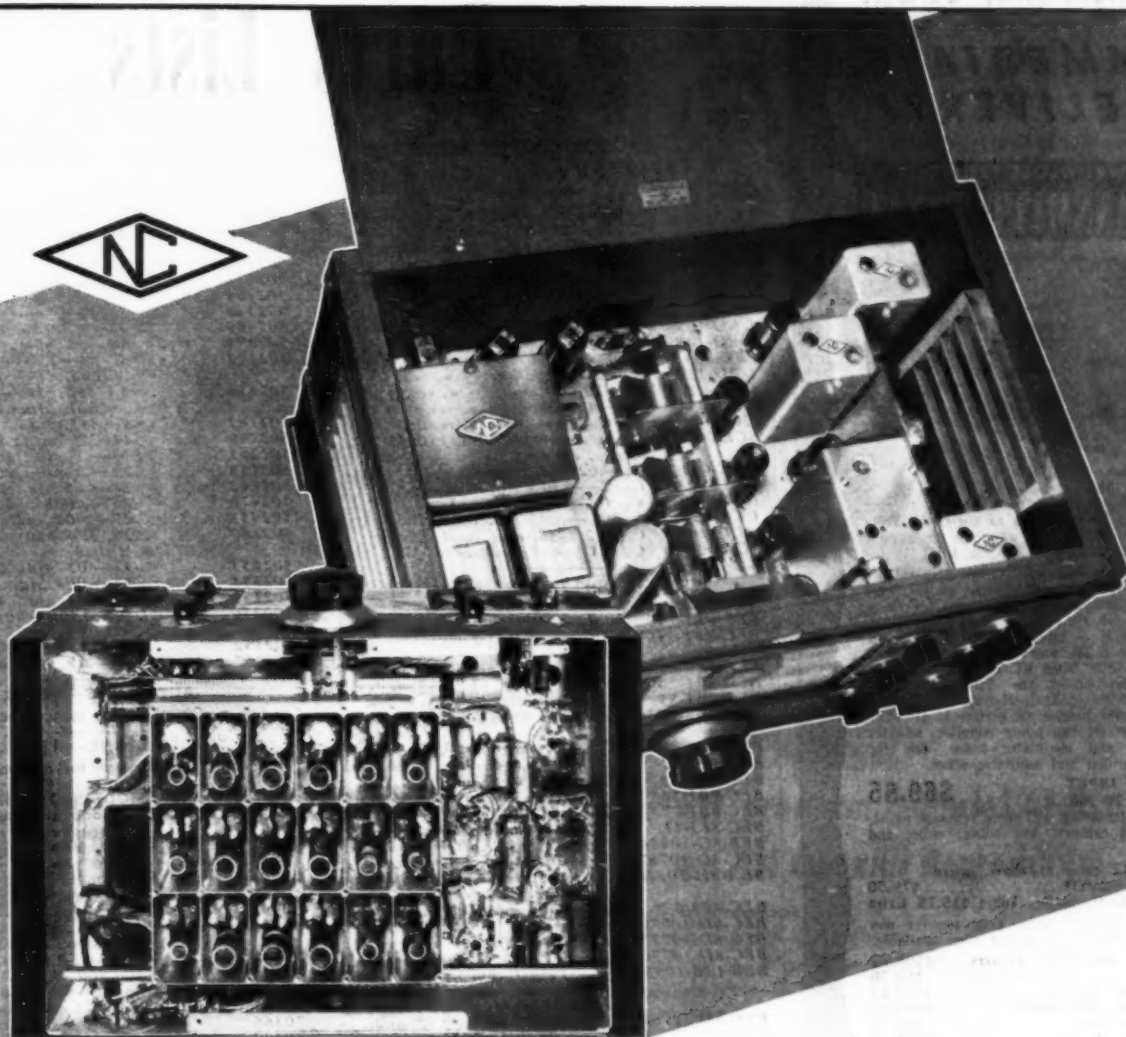
ment knob at the right of the instrument is used to set the meter pointer to zero ohms for the three ohmmeter ranges.

Further details of the new electronic tester will be supplied by The Sterling Manufacturing Company, Cleveland, Ohio.

MERCU-TROL

Mack Electric Devices Company of Elkins Park, Pennsylvania have just announced a new control device, the Mercu-Trol.

Capable of handling up to 2 h.p., this relay, which is available in either normally open or normally closed (Continued on page 78)



NC-2-40D

Beauty goes deep in the NC-2-40D. Deep inside the chassis parts of watchlike precision are assembled with painstaking care. Carefully designed mechanisms enable the controls to respond to your slightest touch. Thorough shielding helps circuits to develop the fine performance, stable operation and uniform response that you expect of a National receiver. We invite you to study the photographs above. They are pictures of quality.

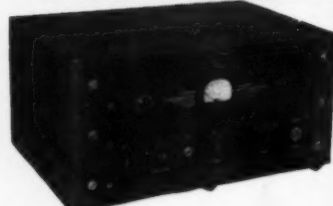
NATIONAL COMPANY, INC., MALDEN, MASS.



AMATEURS! LOOK! Leo W0GFQ Now Offers IMMEDIATE DELIVERY!

On His New, Exclusive, Low Priced

WRL GLOBE TROTTER TRANSMITTER KIT



Jay Leibach, W8VJW

Sandusky, Ohio

Says: "May I congratulate you on turning out such a hot little rig as the Globe Trotter. It's amazing the way this flea power transmitter bucks the heaviest QRM."

Many other actual field reports of amateurs using the Globe Trotter testify to its excellent performance. It's the hottest ham equipment on the market today. The WRL Globe Trotter is capable of 40 watts input on C.W. and 25 watts input on phone on all bands from 1500 KC through 28 Megacycles. Incorporates the Tritet Oscillator using a 40 meter Xtal; Heising choke modulation; three bands, all pretuned; 10, 20, and 80 meters; two power supplies, one for 807 final and modulator tubes, one for speech amplifier and oscillator stage.

40 WATT INPUT

Cat. No. 70-300 **\$69.95**
Complete including all parts, chassis panel, streamlined cabinet, less tubes, coils, and meter.

No. 70-312 same as above, wired by our engineers.....\$79.50
1 Set of Coils, Meter, Tubes \$15.15 Extra

For Fast Delivery order your receiver now from World Radio. Easy pay plan available.

RME 45 (Immediate delivery).....\$198.70
RME 84\$98.70
Hammarlund HQ129X\$173.25
Hammarlund SPC-400-SX\$323.25
Hallicrafters S-38\$39.50
Hallicrafters SX-42\$250.00

★ NEW LOW PRICE ★ 15 TUBE TRANSCEIVER

Complete Transmitting and Receiving Set. 3 SETS IN ONE—6 Tube Receivers for 80 and 40 meter bands; 235 Meg. transmitter; Interphone system. Complete with dynamo. OK for portable work. Includes parts Kit worth about \$400 itself. **\$69.00**
Cat. No. 70-298.....

AC-DC Phone Amplifier. Complete with speaker, less tubes. **\$7.65**
Cat. No. 7-271.....



**New Type PHONO
OSCILLATOR**
Wired, less
tubes. Cat. No. 16-191 **\$5.25**

No aerial required. Utilizes high quality loop both as part of oscillator circuit, and radiating medium. Trimmer provided to adjust frequency to any portion of broadcast band between 1550 KC and 1700 KC. Uses 35L6 and 35Z5 tubes

FREE! Our Latest Flyer

Packed with real buys in radio, electronic, and general merchandise.

Giant Radio Map (Size 3 1/2 ft. x 4 1/2 ft.)15c
Handy Tube-Base Calculator.....25c
Tube and Circuit Book10c
* Prices quoted are domestic. Write for export prices.



Formerly Wholesale Radio Laboratories
Address Dept. RN-12 Council Bluffs, Iowa

Parts Lists

(FOR CIRCUIT DIAGRAMS APPEARING ON PAGES 64 AND 65)

GENERAL ELECTRIC MODELS YRB60-1, YRB60-2

Part No.	Code and Description
URE-007	R ₁ —18 ohm, 1 w. res.
URF-053	R ₂ —1500 ohm, 2 w. res.
URD-029	R ₃ —150 ohm, 1/2 w. res.
URD-113	R ₄ —470,000 ohm, 1/2 w. res.
URD-103	R ₅ —220,000 ohm, 1/2 w. res.
URD-145	R ₆ —10 megohm, 1/2 w. res.
SRC-004	R ₇ —5 megohm vol. control & sw.
URD-129	R ₈ —2.2 megohm, 1/2 w. res.
URD-081	R ₉ —22,000 ohm, 1/2 w. res.
URD-041	R ₁₁ —470 ohm, 1/2 w. res.
UCC-045	C ₁ , C ₁₂ , C ₁₅ —.05 µfd. cond.
SCE-003	C _{2A} , C _{2B} —40/40 µfd., 150/150 v. elec. cond.
UCC-041	C ₈ —.02 µfd. cond.
UCU-1040	C ₄ , C ₅ —330 µfd. mica cond.
UCC-040	C ₆ , C ₁₃ —.01 µfd. cond.
UCC-039	C ₉ , C ₁₀ —.005 µfd. cond.
UCU-1020	C ₃ —47 µfd. mica cond.
SCT-003	C _{10A} , C _{10B} —Tuning cond.

WARD—MODELS 64BR-1205A, 1206A

Part No.	Code and Description
BEC-9B1-74	R ₁ , R ₁₁ —10,000 ohm, 1/2 w. res.
BEC-9B1-34	R ₂ , R ₃ , R ₆ —3.3 megohm, 1/2 w. res.
BEC-9B1-86	R ₇ —100,000 ohm, 1/2 w. res.
BEC-9B1-76	R ₄ —15,000 ohm, 1/2 w. res.
BEC-9B1-85	R ₅ —82,000 ohm, 1/2 w. res.
BEA-10B-10368	R ₇ , S ₁ —1 megohm vol. control & sw.
BEC-9B1-37	R ₈ —10 megohm, 1/2 w. res.
BEC-9B1-97	R ₁₀ —820,000 ohm, 1/2 w. res.
BEC-9B1-33	R ₁₁ —2.2 megohm, 1/2 w. res.
BEC-9B1-56	R ₁₂ , R ₁₃ —330 ohm, 1/2 w. res.
BEC-9B1-77	R ₁₅ —18,000 ohm, 1/2 w. res.
BEC-8F3-11	C ₁ —330 µfd., 500 v. cond.
BEB-8G-10426	C ₂ —45 µfd., ceramic cond.
BEC-8D-10787	C ₃ —.001 µfd., 600 v. cond.
BEA-8H-10320	C ₄ , C ₅ —84-156 µfd., dual ant. & osc. trimmer
BEC-8F3-6	C ₆ —47 µfd., 500 v. cond.
BEC-8D-10770	C ₇ —.1 µfd., 200 v. cond.
BEC-8D-10775	C ₈ —.25 µfd., 200 v. cond.
BEC-8D-10770	C ₉ —.05 µfd., 200 v. cond.
BEB-13B-10334	C ₁₀ , T ₈ —Output i.f. trans., with trimmers. Range of trimmers 39-71 µfd.
BEC-8D-10786	C ₁₁ —.003 µfd., 600 v. cond.
BEC-8D-10774	C ₁₂ —.02 µfd., 400 v. cond.
BEC-8D-10785	C ₁₃ —.006 µfd., 600 v. cond.
BEA-8C-10258	C _{14A} , C _{14B} —10/10 µfd., 150/150 v. elec. cond.
BEC-8D-10784	C ₁₅ —.002 µfd., 600 v. cond.

STEWART-WARNER—MODEL 9000-B

Part No.	Code and Description
502140	6—390 ohm, 1/4 w. res.
502130	10—22,000 ohm, 1/4 w. res.
502133	15—220,000 ohm, 1/4 w. res.
502291	19—4700 ohm, 1/4 w. res.
502269	21—3.3 megohm, 1/4 w. res.
502264	22—47 ohm, 1/4 w. res.
502145	22A, 22B—500,000 ohm vol. control & sw.

502131	24—47,000 ohm, 1/4 w. res.
502136	29—10 megohm, 1/4 w. res.
502128	30—2200 ohm, 1/4 w. res.
502135	31—2.2 megohm, 1/4 w. res.
502133	35-36—220,000 ohm, 1/4 w. res.
502134	37—470,000 ohm, 1/4 w. res.
502138	38—130 ohm, 1/4 w. res.
502469	42—1500 ohm, 1 w. res.
502574	48—33 ohm, 1/2 w. res.
502172	3, 14—25-100 µfd., trimmer cond.
502123	5A, 5B, 5C—Variable gang (with drum)
502162	9—315 µfd., 500 v. cond.
502159	11—50 µfd., 500 v. mica cond.
502155	12—.1 µfd., 200 v. cond.
502158	13—.2 µfd., 200 v. cond.
502262	18—.25 µfd., 200 v. cond.
502470	26—.0008 µfd., 400 v. cond.
502453	27—.002 µfd., 400 v. cond.
502160	28, 32—110 µfd., 500 v. mica cond.
502153	33—.05 µfd., 200 v. cond.
502156	34—.004 µfd., 400 v. cond.
502151	39—.01 µfd., 400 v. cond.
500256	40A, 40B—40/20 µfd., 150/150 v. elec. cond.
502152	43—.02 µfd., 400 v. cond.
502157	46—.05 µfd., 400 v. cond.

AUTOMATIC—MODEL 640

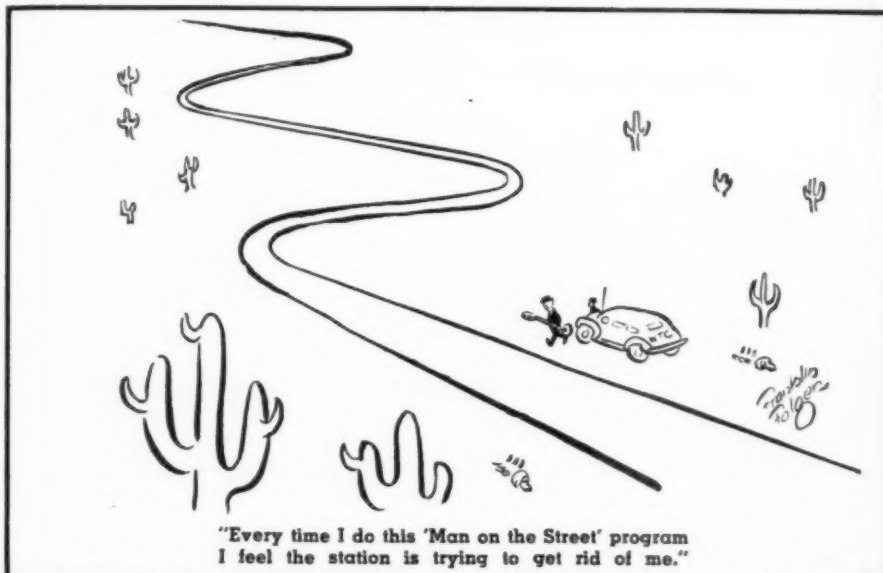
See circuit diagram for component values

TELEPHONE—SERIES D

See circuit diagram for component values

RCA MODELS Q10, Q10A

Part No.	Code and Description
30649	R ₁ —2.2 megohm, 1/4 w. res.
12928	R ₂ —3.3 megohm, 1/4 w. res.
30787	R ₃ —47,000 ohm, 1/4 w. res.
38406	R ₄ , S ₁ —Vol. control & power sw.
30648	R ₅ , R ₆ —470,000 ohm, 1/4 w. res.
30992	R ₇ —10 megohm, 1/4 w. res.
30880	R ₈ —150 ohm, 1/2 w. res.
30152	R ₉ —1000 ohm, 1 w. res.
71290	R ₁₀ —33 ohm, 1 w. res.
3252	R ₁₁ —100,000 ohm, 1/4 w. res.
70627	C ₁ , C ₁₀ , C ₁₅ —.005 µfd., 600 v. cond.
39636	C _{2A} , C _{2B} —220 µfd. mica cond.
70366	C ₃ , C ₄ , C ₅ , C ₆ —Var. tuning cond.
39622	C ₇ —36 µfd. mica cond.
39643	C _{8A} —430 µfd. mica cond.
70367	C ₉ —2-10 µfd. mica trimmer
70361	C ₁₀ , C ₁₁ , L ₁ —First i.f. trans.
70612	C ₁₂ , C ₂₀ —.025 µfd., 400 v. cond.
70615	C ₁₃ , C ₂₅ —.05 µfd., 400 v. cond.
70362	C _{12A} , C _{12B} , C ₁₄ , C ₁₅ , L ₁₀ , L ₁₁ —Second i.f. trans.
70371	C ₁₉ , C ₂₁ , C ₂₂ —50/30/20 µfd., 150/150/20 v. elec. cond.
70617	C ₂₄ —.1 µfd., 400 v. cond.
70360	L ₁ , L ₂ , L ₃ , L ₄ , L ₅ —Antenna coil
70359	L ₆ , L ₇ —Osc. coil
70358	S ₁ —Range sw.
70370	T ₁ —Output trans.



Listen

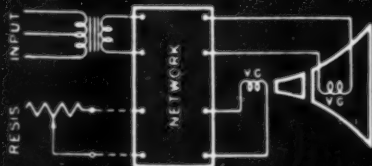
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The Rubber Industry

(Continued from page 45)

of rubber, sulfur, pigments, etc. vary from a 2 to 3 constant and power factors from .5 to .9. These dielectric constants and power factors are well within the allowable range and as a result may be profitably heat treated commercially.

In this connection it is interesting to note that the load on the electronic generator changes with the state of vulcanization or cure. In other words, the extent to which the sulfur and the rubber molecules have joined or combined toward their final condition constitutes a changed condition reflected in their characteristic as a dielectric. The resulting change in dielectric constant and power factor show up as a changing load on the electronic generator.

In most of the rubber curing applications both electronic heating and the steam methods are combined. The mold is preheated electronically and then the job is finished by steam which is capable of maintaining the heat level obtained by the electronic process. This brings the two methods into full contrast, first the comparatively fast but expensive electronic power is used to raise the temperature of the object to full heat throughout and then the cheaper steam power is used to maintain the internal heat instead of trying to raise the temperature from the outside as formerly. Since rubber is a fairly good insulator, this method of heating from the outside in took a long time in addition to the inherent danger, which was always present, of overcuring the outside and undercuring the inside of the product.

As to the power requirements of the installation which as a pilot unit has been used for the preheating of ordinary passenger car tires, preparatory to a brief finishing operation in a steam mold, it draws 25 kw. from a 230 volt, three-phase, 60 cycle source and gives a maximum rated normal high frequency output of 15 kw. This is a regular production model using two RCA 892 R power oscillators and six RCA 8008 rectifiers. The unit stands 72" over-all and is used with an external power transformer and small associated items such as remote control switches, etc.

This development is only the beginning and its ramifications are many and varied. It seems certain though that John Citizen will get better tires, mattresses and rubber boots for less money; a great new field will be opened for electronics; new machinery will be made and installed and vast amounts of electric power will be consumed.

The impact on the rubber industry and, indirectly the public, has been considerable. The prospect now is that even greater things will come from this new electronic processing of the raw materials which go into American consumer goods.

High-Speed Photo Flash

(Continued from page 53)

flash-bulb setting on the shutter solenoid. This unit was used with the writer's miniature *Speed Graphic* which is equipped with a *Kalart* flash gun. The relay in this flash unit is of the 6 volt a.c. type but operates well on 4½ volts d.c. It trips a little too fast, however, the flash going off before the camera shutter opens. A reactance was placed in series with the relay coil control line to slow down the relay. About 16 millihenries was found to be right. The secondary of the output transformer listed in the parts list was perfect and the impedance is varied by means of a 6 ohm rheostat across it.

Conducting the synchronizing test is a simple procedure. A piece of cardboard the size of the face of the reflector is fastened to the reflector. This cardboard should have a hole in the center about 1" in diameter. The purpose of the cardboard is to observe the flash on the ground glass of your camera without the light blinding you in the operation. With the hole focused on the ground glass, set up the flash unit to flash into the camera. Set the synchronizing control knob to the extreme right, open the lens wide, set the shutter for 1/400th, or the fastest between-the-lens shutter speed you have. (A focal plane shutter cannot be used except with the "open-flash-shut" method.). Plug the relay control line into your flash gun. Now press the button. You will probably see nothing on the ground glass the first time. Now advance the control knob to the left just a little. Try another flash. Keep this up until you begin to see something on the ground glass. Keep trying shot after shot until a setting is found where you no longer see the flash on the ground glass. If you have noted the positions of the two points, one where the spot first appeared and one where the spot last appeared, you will have the range in which the flash occurs while the camera shutter is open. Permanently set the control knob in the center of this area, and you are all set.

Obviously, it is not necessary to operate this with a synchronized flash gun. The "open-flash-shut" method may be used. In this case turn the rheostat to the extreme right and leave it there.

Exposure

Your own tests should be made to determine proper exposure because reflectors will vary as to their light reflecting efficiencies and light concentration qualities. As a guide, the results with this equipment were as follows: *Agfa* Isopan Film; F-11 opening; light at 6 ft.

The color of the light is bluish white and daylight film speeds may be used. It is said to give good results in color work.

-30-

December, 1946

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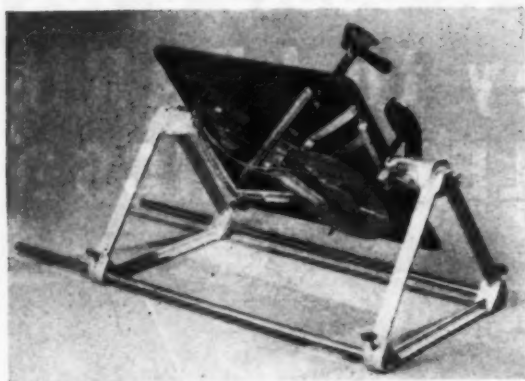
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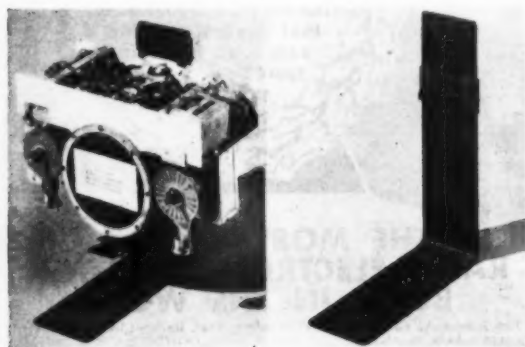
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Autotune Transmitter

(Continued from page 51)

Fortunately, the one wire that had to be removed was the wire closest to the cover plate and very accessible. It was the bare wire running from pin 4 of the tube socket to capacitor C104. We cut this wire at both ends and soldered a length of solid No. 18 insulated hookup wire to pin 4 and to the capacitor. There was enough room between the socket and the top of the chassis to draw the wires up to the top, after which the aluminum cover plate was replaced. To keep the leads short, we mounted the crystal holder at the right edge of the master oscillator chassis with the crystal horizontal and protruding through a hole cut in the black panel which forms the right end of the transmitter cabinet.

The modification proved very successful, and we were pleased with the simplicity of the circuit arrangement. By substituting a jumper for the crystal, the original circuit is restored and the transmitter can be tuned up or the Autotune system set for a channel number by following the instructions in the calibration book. Crystal calibration of the tuning dial can be performed as usual, and when the tuning is completed, the jumper can be replaced with a crystal whose natural frequency is the same as the master oscillator frequency.

We found that tuning was not critical and that the crystal controlled the frequency over a range of detuning considerably greater than any drifts that could be caused by the most extreme variations in temperature and humidity.

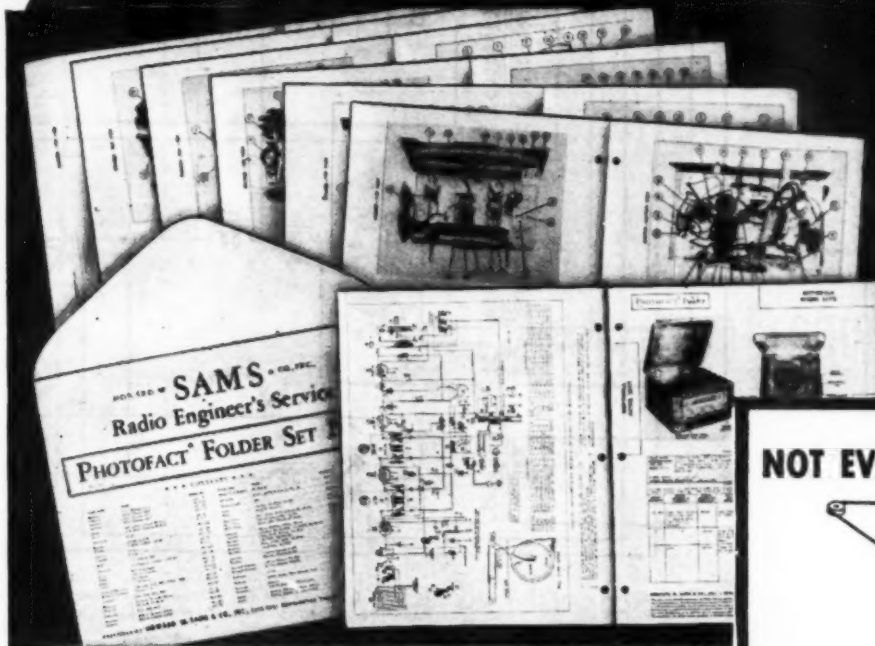
When the jumper is replaced by the crystal after tuning, the grid current remains at or near its maximum. However, for greater stability and less crystal current, it is advisable to turn the "B" knob slightly clockwise to operate on the high-frequency side of the resonance curve.

The next test was to set an Autotune channel for 12 mc., still using the same 1000 kc. crystal. When the channel switch was turned to other channels and then returned to the 12 mc. channel, the Autotune mechanism brought the transmitter to within 2 cycles of the original setting. The experiment was next repeated with the unmodified circuit (crystal replaced by jumper), and the Autotune mechanism reset the controls to approximately 30 cycles of the original tuning. This test proved that the automatic tuning, although excellent without crystal control, is still more accurate with crystal control.

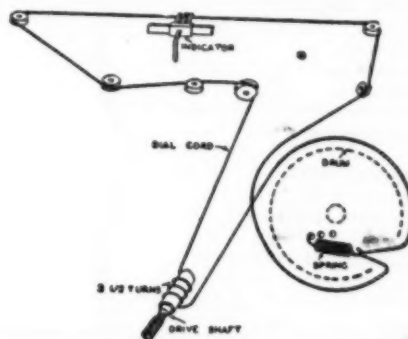
The same crystal can be used for more than one frequency. For example, a 1.190 mc. crystal can be used for final frequencies of 3.570 mc., 7.140 mc., and 14.28 mc. This example was chosen because all three final frequencies are in amateur bands, and illustrates how the same crystal can be

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Cut This Out and Mail It to Your Distributor! If you do not know his name and address, send it directly to Howard W. Sams & Co., Inc., 2924 East Washington Street, Indianapolis 6, Indiana, and we will see that your nearest distributor gets it. In Canada—write to A. C. SIMMONDS & SONS, 301 King Street East, Toronto, Ontario. Canadian Price \$1.75.

PLEASE PRINT

☐ Send Set No. 7

☐ Send Set No. 8

(Circle one or more of following) Send Set No. 6, 5, 4, 3, 2, 1, (\$1.50 a Set)

☐ Send me a DeLuxe Remington Rand Binder @ \$3.39.

My (check) (money order) (cash) for _____ is enclosed.
(If you send cash, be sure to use registered mail)

Name _____

Address _____

City _____ Zone _____ State _____

Company Name _____

My Distributor's Name _____ City _____

HENRY RADIO

Most models listed below are in stock . . . ready for immediate delivery:

Hallcrafters S38 complete.	\$ 39.50
Hallcrafters S40 complete.	79.50
Hallcrafters S36A	307.50
Hallcrafters SX42	250.00
Hallcrafters SP44	99.75
Hammarlund HQ-129X & speaker.....	168.00
Hammarlund SP-400-X & speaker.....	342.00
National NC-2-40D	241.44
National HRO-3TA1 and HRO-5RA1	274.35
National NC-46	97.50
National 1-10A with tubes and coils.....	67.50
RME-45 complete.....	198.70
RME-84 complete.....	98.70
RME DB-20 complete.....	68.20
Pierson KP-81 complete.....	318.00
Panoramic panadapter complete.....	99.75
Temco 75GA transmitters...	495.00
Meck 60T transmitters.....	150.00

Gordon, Amphenol, Johnson rotary beams.

The new Hallcrafters and Collins receivers, transmitters, VFO, etc. as fast as available.

All other receivers, transmitters, parts, etc. as available.

Prices subject to change.

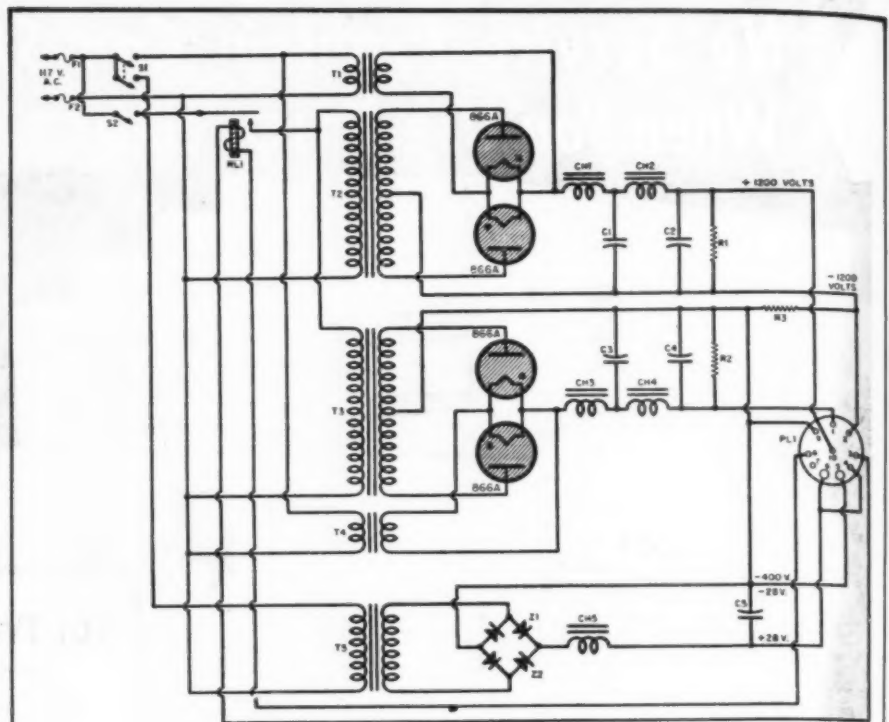
THE delivery situation is much improved. I can make immediate delivery of most receivers and other apparatus. Take advantage of the extra service and selection you get by dealing with me, based on my reputation as the world's largest distributor of short wave receivers. Send me your order now. Send five dollars and I will ship at once C.O.D. Or order on my 6% terms. I finance the terms myself to give you better service and save you money. Trade-ins accepted. Tell me what you have to trade, and let's make a deal. Besides having all amateur receivers and transmitters, I also have a complete stock of all other amateur apparatus and parts, also test equipment, etc. I have real bargains in the really good war surplus such as SCR-211's, BC-610, BC-342, BC-348, BC-312, parts, etc. Write, phone, wire or visit either of my stores.

BOB HENRY
WOARA

HENRY RADIO

BUTLER, MISSOURI AND
LOS ANGELES 25, CALIF.

"WORLD'S LARGEST DISTRIBUTORS
OF SHORT WAVE RECEIVERS"



R₁—25,000 ohm, 60 w. res.
R₂—10,000 ohm, 20 w. res.
R₃—13.5 ohm, 2 w. res.
C₁, C₂—2 μfd., 2000 v. cond.
C₃, C₄—8 μfd., 600 v. cond.
C₅—6000 μfd., 50 v. cond. (May consist of sufficient smaller units to total 6000 μfd.; for example, three Cornell-Dubilier FA5020, 2000 μfd. units.)
T₁, T₂—Fil. trans. 2.5 v. @ 10 amps. (Thordarson T19F90 for each, or Kenyon T-366 dual-secondary combines both)
T₃—Plate trans. 3000 v., c.t. @ 350 ma. (UTC PA311, Thordarson T19P63, or equivalent)
T₄—Plate trans., 1000 v., c.t. @ 400 ma. (Stancor P8581, UTC PA301, UTC S43, or equivalent)
T₅—Trans., 36 v. @ 10 amp. (Stancor 2P134 or equivalent)

CH₁, CH₂—5-20 hy, 75 ohm, 500 ma. swinging choke (Thordarson T19C38 or equivalent)
CH₃, CH₄—12 hy, 90 ohm, 400 ma. smoothing choke (Thordarson T19C44 or equivalent)
CH₅—0.5 hy. (or greater), .25 ohm res. (or less), 12.5 amp. d.c. "A" choke, (Stancor C1705 or equivalent)
S₁—D.p.s.t., 125 v., 5 amp. toggle sw.
S₂—S.p.s.t., 125 v., 5 amp. toggle sw.
PL₁—Plug (Cannon U-7/U)
RL₁—S.p.s.t., 24 v. d.c. winding, 115 v., 10 amp. contacts, relay
Z₁, Z₂—Selenium dry disc rectifier stack, 40 plate (Fansteel 7D0960 or equivalent; any bridge-type unit rated at 15 amps, and 40 v. will be satisfactory)
4—866A rectifier tubes
Note: all fuses are to be 15 amperes.

Diagram of power supply to be used for 117 v. operation. The transmitter as supplied, is designed for 28 v. d.c. power source.

used for an Autotune position in the 80-meter, 40-meter, and 20-meter bands. Without changing crystals, the amateur has a crystal-controlled frequency in each band, all pre-set, available by simply turning the channel selector switch.

For frequency selection requiring a change of crystals, Autotune automatic tuning can be employed by simply

replacing the crystal in addition to turning the channel selector switch, assuming, of course, that the channels have been pre-tuned.

The writer is indebted to engineers H. M. Wood, who designed the a.c. power supply, and E. M. Brinck, who conducted the crystal-control experiments, for their valuable aid in preparing this article.

Table gives preset adjustments for autotune mechanism.

CONTROL "A" POSITION	MASTER-OSCILLATOR FREQUENCY (mc.)	FIRST STAGE MULTIPLICATION	SECOND STAGE MULTIPLICATION	FREQUENCY OUTPUT (mc.)
1	1.0-1.2	2	—	2.0-2.4
2	1.2-1.51	2	—	2.4-3.0
3	1.0-1.2	3	—	3.0-3.6
4	1.2-1.51	3	—	3.6-4.0
5	1.0-1.2	4	—	4.0-4.8
6	1.2-1.51	4	—	4.8-6.0
7	1.0-1.2	2	3	6.0-7.2
8	1.2-1.51	2	3	7.2-9.0
9	1.0-1.2	3	3	9.0-10.8
10	1.2-1.51	3	3	10.8-12.0
11	1.0-1.2	4	3	12.0-14.4
12	1.2-1.51	4	3	14.4-18.1
13 (L.F.)	—	—	—	0.2-1.5



Amphenol Components

GIRDLE THE GLOBE—



and the Frequency Spectrum, Too!

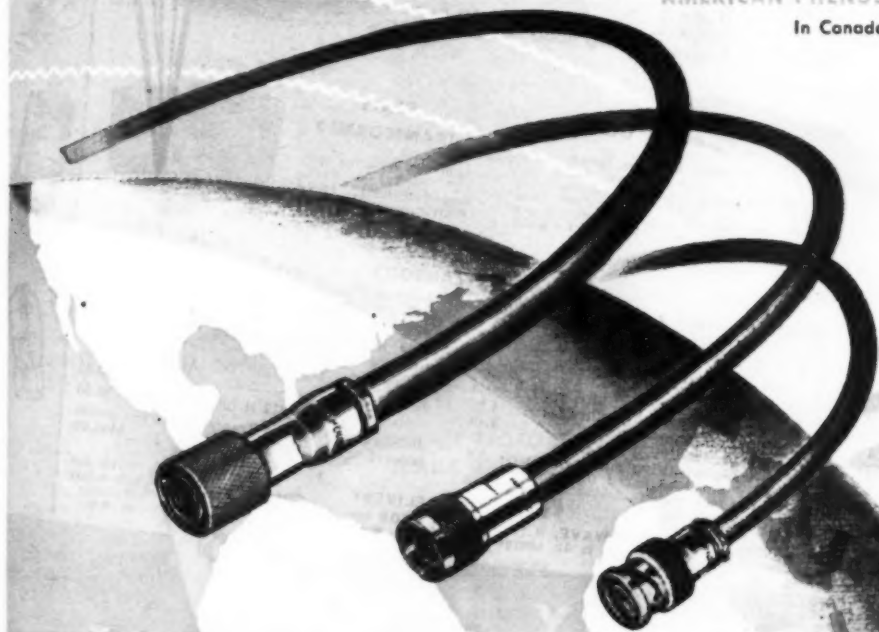
In the eyes of amateurs and professionals of every nation Amphenol components represent the last word in electrical and mechanical design and correct manufacture.

From high voltage, high-frequency uses in the temperamental top segments of the spectrum, down through the high-current, low-voltage industrial applications — there are Amphenol cables, connectors, plugs and fittings designed and built to hold to the irreducible minimum loss of power, potential or waveform.

For Radar, Television, F.M., Railroad, Broadcast and Industrial use; Amphenol components speak the universal language of scientific efficiency, and they are available in the most complete line available from any one source in the world today. Write today for prompt attention to your needs.

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COAXIAL CABLES AND CONNECTORS • INDUSTRIAL CONNECTORS, FITTINGS AND CONDUIT • ANTENNAS • RADIO EQUIPMENT • PLASTICS FOR ELECTRONICS

What's New in Radio

(Continued from page 68)

types, features hermetically sealed heavy tungsten contacts with mercury to mercury make and break in inert gas and heavy glass enclosure for the tube. The unit is dust and moisture



proofed and is safe under all operating conditions.

The physical size of the unit is small, 2 5/8" x 4 1/2" x 2 1/4". Motor loads up to 2 h.p. at 110 or 220 volts, a.c. can be handled, as can current loads

up to 35 amperes, 110 volts or 25 amperes at 220 volts, a.c.

Additional details and literature covering this relay will be furnished you on request by *Mack Electric Devices Company*, 518 Township Line, Elkins Park, Pennsylvania.

FLEET CONTROL

The *Hammarlund Manufacturing Company Inc.* of New York has recently introduced a new two-way communications system which is particularly adapted for the routine operation of motor fleets.

The system features the selection of any one of 84 mobile units by means of signalling frequency when four digit code calling numbers are used. If five digit code numbers are used, 126 mobile units may be selected. Operation of this unit is similar to that of the dial telephone. Special features eliminate breaking-in by other mobile units when transmission is in progress and the non-interference with mobile units not being called. The system also provides for calling all units simultaneously or selected groups may be chosen at will.

Calls may be made and the message started in 3 1/2 seconds, while the unit can be returned to normal standby in less than .6 second after completion of the transmission.

The mobile unit is equipped with a



panel indicator light which gives a "busy" signal when the system is in use. Current drain during standby is .25 amperes at 6 volts and .0025 amperes at 180 volts, d.c.

Full details of this Fleet Control system will be furnished upon request to *The Hammarlund Manufacturing Company Inc.*, 460 West 34th Street, New York 1, N. Y.

MULTI-TESTER KITS

Radio Kits Company is offering a new Multi-Tester Kit which provides practical experience in the construction of volt-ohm-milliammeters for students and others interested in radio.

The unit has five voltage ranges, three current ranges, and three ohmic ranges. All of the ranges are regulated by knobs. The meter features a



Ham Specials

EVERYTHING IN RADIO, ELECTRONIC, AND COMMUNICATIONS SUPPLIES



DYNAMOTOR

12 Volt dynamotor. 235 Volts output at 90 mls. Complete with filter, mounted in can 6 1/2" x 5 1/2" x 3 1/2" with cover. used but perfect. \$2.95



VT-127A/100 TS TUBE

This Triode is capable of full output up to 600 MC; a pair will take a kilowatt input with exceptionally high efficiency. Plate dissipation is 100 watts; Rating-Class C Telephony; Plate Voltage—2500 V; Plate Current 200 ma; Grid Voltage 150 V; Grid Current—15. Filament Current 10 a; Filament Voltage 5V; Amp Factor—15. Special \$3.25

Special Mykroy socket for above tube..... \$1.25
Heat Radiating Caps for VT 127..... 2 for \$.25



JAN

829B/3E29 TUBE

and shielded aluminum socket. Has built-in by-pass condensers. Both for the price of the tube socket..... \$6.95



A GOOD BUY

Full Wave selenium rectifier perfect for bias application—use your DC relays from an AC source—unit is very small and compact. Only requires 3" x 1 1/2" mounting space made by G.E. \$4.99 or 5 for \$4.00

PLATE TRANSFORMER

6200 Volt CT—700 Mils. 110 Volts. 60 Cycles tapped Primary 2KVA Amertran.

Limited Quantity \$39.95

MODULATION TRANSFORMER

Perfect for input up to 300 Watts—Class C loads on primary No. 1, 14000 Ohms—Primary No. 2 is designed for screen of Tetrode or Pentode—primary will match 811, 809, TZ20 and TZ40 Tubes. Complete factory specifications and circuit diagram included..... \$4.95
W.E. driver transformer Class B—matches 6L6 in Push Pull to any Class B grids. Perfect match for above Transformer..... \$3.95

We Carry a Complete line of B & W Coils and Westline Xtals in stock. Send us your request or ask for catalog!

Workshop Associates Antenna 2 meter. 6 element beam-run 200 Watts input; get a kilowatt effective power into the ether—most beautiful 2 meter beam we have ever seen..... \$19.00
10 meter beam ant. on its way—write for additional information.

G.E. Pyranol 2mfd 4000 Volt filter 23F47..... \$5.50
G.E. Pyranol 4mfd 2000 Volt filter 22F68..... 4.25
G.E. Pyranol 2mfd 2000 Volt..... 2.49
CD Dykanol 2mfd 1500 Volts..... 2.25
Aerovox filter conds. 6mfd 1500 Volts..... \$1.98
10 assorted transmitting mica condensers. All well-known brands designed for high Voltage. Assortment your price..... \$1.98

MISCELLANEOUS

Antenna Change over relay. Leach Type 1357 DG—13F—DPDT—plenty of spacing—mounted on low loss bakelite..... \$2.50
1000 KC Xtal precision AT Cut mounted in standard holder..... \$4.95
Weston—No. 476—0-130 Volt AC 3 1/2" Meter; special..... \$6.50
United Electronics 612 H tube..... \$4.95
In Stock GA75 Tameo Transmitter. First orders honored first..... \$495.00

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Expert Cable Address MICROWAVE, N.Y.C. All Prices FOB our Warehouse, N.Y.C. W2BNW is in charge of our ham dept.

IMMEDIATE DELIVERY

NIAGARA RADIO SUPPLY

160 Greenwich St., New York 6, N. Y.

ENERGY



The feature Model 20 Drive Speed Alliance Phonomotor operates 110 or 220 volts for 40, 50 or 60 cycles. It will handle 100 watts, runs at an even speed, is smooth, quiet, positive friction-free drive. Apply mounted bearings with large oil reservoirs insure long life. A slip-type fan gives cool operation—avoids any possible injury.

The Alliance Model K Phonomotor, a 20 cycle motor to the Model 20, operates on 110 volts. 25 cycles at 15 watt input. Motor and fan plate on Alliance phonomotor are oil sealed mounted in the cabinet mounting plate, to minimize vibration.

MINIATURE MOTORS THAT
MAKE 'EM MOVE

●Light weight, compact, interchangeable power sources . . . small motors that can be mass produced at low cost are in rapidly growing demand! And Alliance has a "Head Start" in making millions of small electric motors.

●Alliance phonomotors drive most of the turntables, record changers and recorders for the radio-phonograph industry. And Alliance Powr-Pakt Motors rated from less than 1-400th h.p. up to 1-20th h.p. will drive fan blades, motion displays, projectors and actuate switches and controls!

●Write today . . . find out how Alliance Motors can help to drive your products to market!

WHEN YOU DESIGN—KEEP

alliance

MOTORS IN MIND

ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO
December, 1946 79

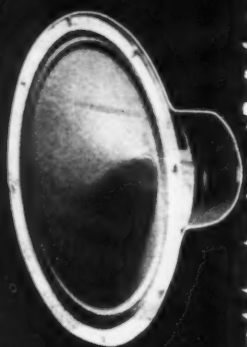
The MARK of Fine Speakers.....



OXFORD

THE JOBBERS' CHOICE

1. BECAUSE OXFORD SPEAKERS have always had a wide acceptance for all types of replacement, many times the original speaker can be exactly replaced from stock.
2. BECAUSE OXFORD Speakers are priced to sell, have the necessary "Eye-Appeal" which coupled with a high degree of engineering skill, makes them a finer product.
3. BECAUSE OXFORD Speakers are backed by a firm whose sales policies are fair and workable, and whose engineering staff is alert to the jobber's every situation.
4. BECAUSE OXFORD Speakers are the main product, and not a by-line, of a firm which has been specializing in the manufacture of loudspeakers for the past 13 years.



THE Jobber Line of OXFORD SPEAKERS is complete in every respect, from 2 in. to 15 in. units. All the larger models include the exclusively OXFORD, patent-pending, pressure-thread device which positions the pole piece and magnet with over 800 lbs. psi pressure.

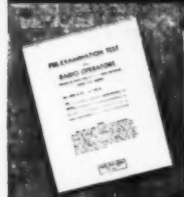
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PRE-EXAM TESTS

For Commercial Radio Operator

FCC LICENSE EXAMINATIONS



Rehearse the FCC license examinations
Practice the procedure
Practice the multiple-choice examination methods used by FCC

Prepared by Arthur R. Nilson, Famous Co-author of Nilson and Hornung's
RADIO QUESTIONS AND ANSWERS
Cleveland Institute of Radio Electronics, RN-12, Terminal Tower, Cleveland 13, Ohio

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Avoid Failure on FCC Commercial Radio Operator License Examinations!

USE NILSON'S COMPLETE PRE-EXAMINATION TESTS AND COACHING SERVICE

Enables You To

Check your knowledge
Locate your weak points
Correct your weak points before taking the actual examination

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RN-12 Terminal Tower, Cleveland 13, Ohio
Please send information about Pre-Exam Tests.

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Address
City Zone State

sensitive needle and clear dial for easy reading.

The kit comes complete with assembly instructions and is easy to construct. Details will be furnished by

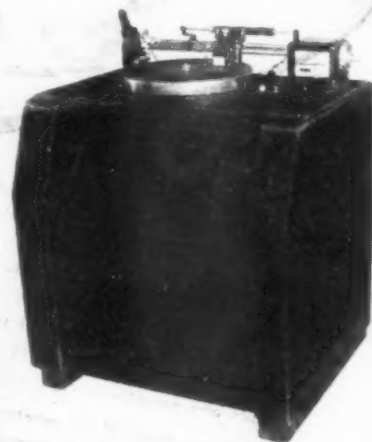


Radio Kits Company, 120 Cedar Street, New York 6, New York. Ask for information on Model 120.

STUDIO RECORDER

Of interest to broadcast engineers is the new No. 523 studio recorder recently announced by Fairchild Camera and Instrument Corporation.

This unit was designed to meet the requirements of commercial recording studios and the radio industry for instantaneous or wax recordings, or the sound film industry for dubbing sound from disc to film. The table accommodates 18" flowed wax masters, acetate or thicker wax masters. The positive 33.3 r.p.m. drive permits absolute



timing with the synchronous motor, which also makes the a.c. line the only interlocking device needed for dubbing sound.

Additional details of the No. 523 will be furnished by Fairchild Camera and Instrument Corporation, Jamaica, New York.

COMBINATION CONSOLE

Western Sound & Electric Laboratories, Inc. has announced the production of their new Sheraton lowboy style radio-phonograph combination.

Available in either walnut or mahogany finishes, the Symphonola Model 200 features a 12" PM speaker, base

yesterday
proved
its quality

today
proves
its VALUE



IN THE FIELD



IN THE SHOP



Combination "DYNOPTIMUM" tube and set tester Model 802N

Accurate — dependable — compact — with a degree of flexibility that places it in a class all its own.

There you have it in a nutshell—a *partial* description of RCP's new, improved Model 802N. But *only* a partial description—because you can't describe this remarkable servicing instrument *fully* to anyone who has never used it.

Only by using it yourself can you learn all the features

that make Model 802N the unquestioned favorite of radio service men everywhere.

Examine Model 802N next time you see your jobber. Use it. Find out how it can speed up your work — add dollars to your income.

For a complete display of RCP's extensive line of fine testing equipment write for Catalog No. 129.

Check these features

- * Exclusive method of A-C voltage measurements which eliminates temperature and frequency errors.
- * Famous Dynoptimum test circuit employs 6H6 tube and has zero temperature characteristic while providing an extremely wide frequency range of 30 cps to 50 kc.
- * 100,000 — ohm range is battery operated permitting resistance checks when regular A-C supply is not available.
- * Capacity meter for testing electrostatic and electrolytic capacitors for leakage.
- * Special adaptations are included for checking individual sections of multi-purpose tubes.
- * Convenient jack for head-phone noise test to check swinging, noisy, or high-resistance connections.
- * Large, rugged 4½" square-face meter with Alnico high-torque movement for quick, accurate readings.
- * Housed in handsome, hand-rubbed, hardwood carrying case with compartment and self-latching cover. Furnished with high-voltage test leads.



RANGES

D-C VOLTMETER: 0/10/50/500/1000 volts.
(1000 ohms per volt)
A-C VOLTMETER: 0/10/50/500/1000 volts.
D-C MILLIAMETER: 0/1/10/100/1000 milli-
amperes.
D-C AMMETER: 0/10 amperes.
OHMMETER: 0/500/5000 ohms, 0/0.1/1/10
megohms.
DECIBEL METER: -8 to +15, +15 to +29, +29 to
+49, +32 to +55 DB.
OUTPUT METER: 0/10/50/500/1000 volts.

If you'd like to have a complete display of America's finest line of testing equipment, write for a free copy of Catalog No. 129.

RCP INSTRUMENTS—BEST FOR EVERY TEST

RADIO CITY PRODUCTS COMPANY, INC.

127 WEST 26th STREET



NEW YORK 1, N. Y.

and treble control on either phono or radio and automatic record changing for ten 12" or twelve 10" records. The unit operates with the doors of the cabinet either open or closed.

The console is 33" high, 22" wide and 16" deep.

Additional information on this Sym-



phonola Model 200 will be supplied by Western Sound & Electric Laboratories, Inc., 3512 West St. Paul Avenue, Milwaukee 8, Wisconsin.

"FLEXITEST" SWITCH

Westinghouse Electric Corporation has announced a new test switch for the rapid and accurate testing of switchboard instruments, meters and relays from the front of the board.

Designed with up to ten elements and rated at 250 volts, 30 amperes, combinations of current and potential switches are included, as required, for

the various types of instruments to be tested.

The "Flexitest" switch is enclosed in a black Moldarta case with cover of similar material which blends with instrument and relay cases and with panels.

Individual switches are of the knife blade type and separated by barriers. Moldarta switch handles are recessed for inserting identification cards. Each switch handle is drilled for insertion of an interlocking bar to tie together any three adjacent handles. Means are provided for the attachment of spring clips when individual test leads are used instead of a test plug.

Further information on these switches may be secured from Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

tone COMPENSATING ATTENUATOR

Designed to enable the authentic reproduction of the musical scale, The Daven Company has recently announced their new Tone Compensating Attenuator, the Type LAC-720. Essentially a ladder network, designed so that the frequency characteristics follow the hearing response curves of the human ear, this unit provides a response such that the bass frequencies have a smaller loss than the middle or upper registers, without rendering a false response.

By proper external connection to lugs on the terminal board, it is possible to obtain six different attenuation



vs. frequency curves with the unit, varying from the "human ear type of response" to a flat frequency response. When the unit is wired for a flat frequency response it functions as a straight ladder of 2.5 db. per step.

Complete engineering information, including a series of six attenuation vs. frequency curves, will be furnished upon request to The Daven Company, 191 Central Avenue, Newark, New Jersey.

SILICON CRYSTAL CONVERTERS

The Electronics Division, Sylvania Electric Products Inc. has announced production on a line of compact silicon crystal converters for use as first detectors in high frequency superheterodyne receivers.

These crystals, which are permanently preset in a small cartridge measuring approximately $\frac{3}{4}$ " long and $\frac{1}{4}$ " in diameter, are available in three types designed for frequencies up to

A MUST IN EVERY LAB . . .
ON EVERY SERVICEMAN'S BENCH . . .
IN EVERY SERVICE KIT . . .

A pocket-size

OSCILLOSCOPE *The* POCKETSCOPE

- So SMALL in size (4" x 6 $\frac{3}{8}$ " x 10")
- So LIGHT in weight (5 $\frac{3}{4}$ lbs.)
- So COMPLETE in performance
- So INEXPENSIVE in price
- Plus WIDE-ANGLE VISION: on shelf, on floor, on bench
- Plus RETRACTABLE LIGHT SHIELD: for increased visibility.



\$66
f. o. b. Phila

A 2" "pocket-size" 'scope incorporating the cathode ray tube, vertical and horizontal amplifiers, linear time base oscillator, synchronization means and self-contained power supply.

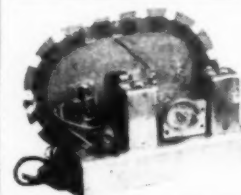
FOR DELIVERY:

Contact your nearest jobber. If he doesn't have the POCKETSCOPE available, contact us direct.



WATERMAN PRODUCTS CO.
INCORPORATED
PHILADELPHIA 25, PENNSYLVANIA

TUNERS — AMPLIFIERS



Singer TUNER

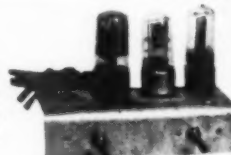
Ideal for P.A. tuner. 12SA7, 12SQ7, 12SK7 tubes. Super-Het. Makes any amplifier into full-powered radio. Compact.

\$7.95
less tubes

COMPLETELY WIRED

Singer AMPLIFIER

AC-DC for Call system or phono amplifier. Uses 12SQ7, 50L6, 35Z5 tubes. Compact. Ready to operate.



Less Tubes \$2.95

Special COMBINATION OFFER

Amplifier & Tuner described above. Combine to make Super-het Radio & Phono combination. Full instructions supplied.

\$9.45
ONLY

25% deposit on C.O.D. orders
IMMEDIATE DELIVERY

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Fight Tuberculosis

**BUY XMAS
SEALS**



TYPE "A"
ASSEMBLY BIT



COMMON
SCREWDRIVER



IN POWER DRIVING CLUTCH HEADS OUTMODE ALL OTHER SCREWS

Check This Point by Point Comparison

Regardless of the type of screw you are using now, **RECESSED HEAD OR OTHERWISE**, check their performance against the exclusive **CLUTCH HEAD** features that short-cut the way to safer, smoother, speedier, and lower-cost production.

✓ High visibility for an easy-to-hit target with resultant increased speed born of operator confidence.

✓ Automatic dead-center entry for sure straight driving. **CLUTCH HEAD'S** Center Pivot Column prevents driver canting.

✓ All-square engagement that eliminates "ride-out" (as set up by tapered driving)...disposing of slippage hazard and need for fatiguing end pressure.

✓ The **CLUTCH HEAD** Lock-On, uniting screw and bit as a unit for easy one-handed reaching to hard-to-get-at spots.

✓ The unmatched tool economy of the rugged Type "A" Bit which may be restored... *repeatedly*... to original efficiency by a 60-second application of the end surface to a grinding wheel.

✓ The only modern screw basically designed for operation with a common screwdriver to simplify field service.

This Type "A" Bit is credited by an automobile manufacturer with driving 214,000 screws continuously and without reconditioning... on an operation calling for unusually high torque driving.



Service men and product users appreciate the convenience of making adjustments with an ordinary screwdriver which need only be reasonably accurate in width... the thickness being secondary.

UNITED SCREW AND BOLT CORPORATION

CLEVELAND 2

CHICAGO 8

NEW YORK 7

Good news for FM and TELEVISION set owners

KINGS

tunable dipole antenna

Now... **KINGS ELECTRONICS** brings you the answer to low signal interception... a **TUNABLE dipole antenna**. Weak stations can be brought in clearly and powerfully by a simple adjustment of the collimated arms. Truly a tremendous advantage over antennas of conventional design. And note the range! The Kings Dipole covers all bands from 62 mc. to 840 mc. for reception of black-and-white, color and experimental television, as well as FM and amateur communication.

The Kings Dipole is a well-constructed, sturdy, corrosion-resistant antenna that will please your customers and build good-will and sales for yourself. Don't delay write today for further information about this unique, powerful **TUNABLE dipole**.

Model A1100. List price

\$22⁵⁰

(Antenna only)

TRANSMISSION LINES AVAILABLE WITH KINGS DIPOLE ANTENNA

Cat. No. 590. Special weather-proofed line having the correct surge impedance to match the Kings antenna and the standard television receiver.

Cat. No. 590-50, 50 feet.....\$ 8.75 List Price

Cat. No. 590-75, 75 feet.....\$10.70 List Price

Cat. No. 590-100, 100 feet.....\$12.60 List Price

Cat. No. 501. Ultra low-loss transmission line of the co-axial type. Especially recommended for minimum loss of power from antenna to set. Has highest efficiency of any line for this purpose.

Cat. No. 501-50, 50 feet.....\$17.50 List Price

Cat. No. 501-75, 75 feet.....\$23.75 List Price

Cat. No. 501-100, 100 feet.....\$30.00 List Price

Cat. No. 501-150, 150 feet.....\$42.50 List Price

Cat. No. 501-200, 200 feet.....\$55.00 List Price

Price includes 2 Co-axial Connectors: 1-A-229, 1-30-239.

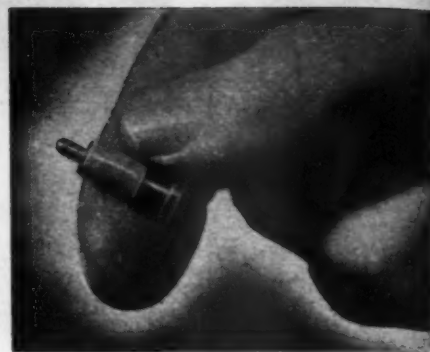
KINGS ELECTRONICS

372 CLASSON AVENUE, BROOKLYN 5, N. Y.

manufacturers of

MICROPHONE PLUGS AND JACKS • CO-AXIAL CONNECTORS
TELEVISION ANTENNA • VARIABLE CONDENSERS • WAVE GUIDES
WAVE TRAPS • RADAR ASSEMBLIES AND SPECIAL EQUIPMENT

10,000 mc. In contrast to vacuum tubes, these crystal converters require no filament or heater supply and take only a fraction of the physical space. Low thermal noise and i.f. impedance are other important features, according to the company.



Type 1N21B is designed for frequencies in the region of 3000 mc. and is rated as follows: conversion loss, 6.5 db. maximum; thermal noise ratio, 2.0 maximum; i.f. resistive impedance, 200 to 800 ohms. Corresponding characteristics for types 1N23B and 1N25 crystals are as follows: 10,000 mc. and 1000 mc.; 6.5 db. and 8.5 db.; 150-600 and 100 to 400 ohms.

Additional details of these converters will be furnished by *Sylvania Electric Products Inc.*, Emporium, Pa.

REPLACEMENT RESISTORS

A new line of composition resistors for the radio serviceman and other users of electronic equipment, has been announced by the Specialty Division of *General Electric Company's* Electronics Department.

Capable of being operated at full rating in ambient temperatures up to 70 degrees (168 degrees F.), these resistors are available in standard RMA values and in sizes of 1/2, 1 and 2 watts.

Three hundred and fifty volts r.m.s. may be applied continuously to the 1/2 watt unit, five hundred volts r.m.s. to the 1 watt unit and one thousand volts r.m.s. to the 2 watt unit, providing the wattage rating is not exceeded.

These resistors are highly resistant to humidity and feature pigtail leads which are claimed to be resistant to breakage at the body junction.

Further information and a specifications sheet on these new resistors may be obtained from the Specialty Division, Wolf Street Plant, *General Electric Company*, Syracuse, New York.

PORTABLE TIME SWITCH

An item of interest to the serviceman-dealer is currently being offered by *Miller-Harris Instrument Company* of Milwaukee.

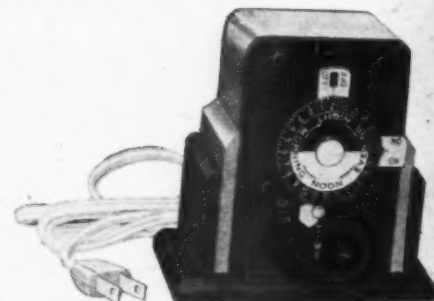
Known as the Robot Portable Time Switch, this unit may be used in many home appliance and radio timing operations, including turning a radio on or off, controlling an electric roaster, starting electric percolators, defrosting refrigerators, etc.

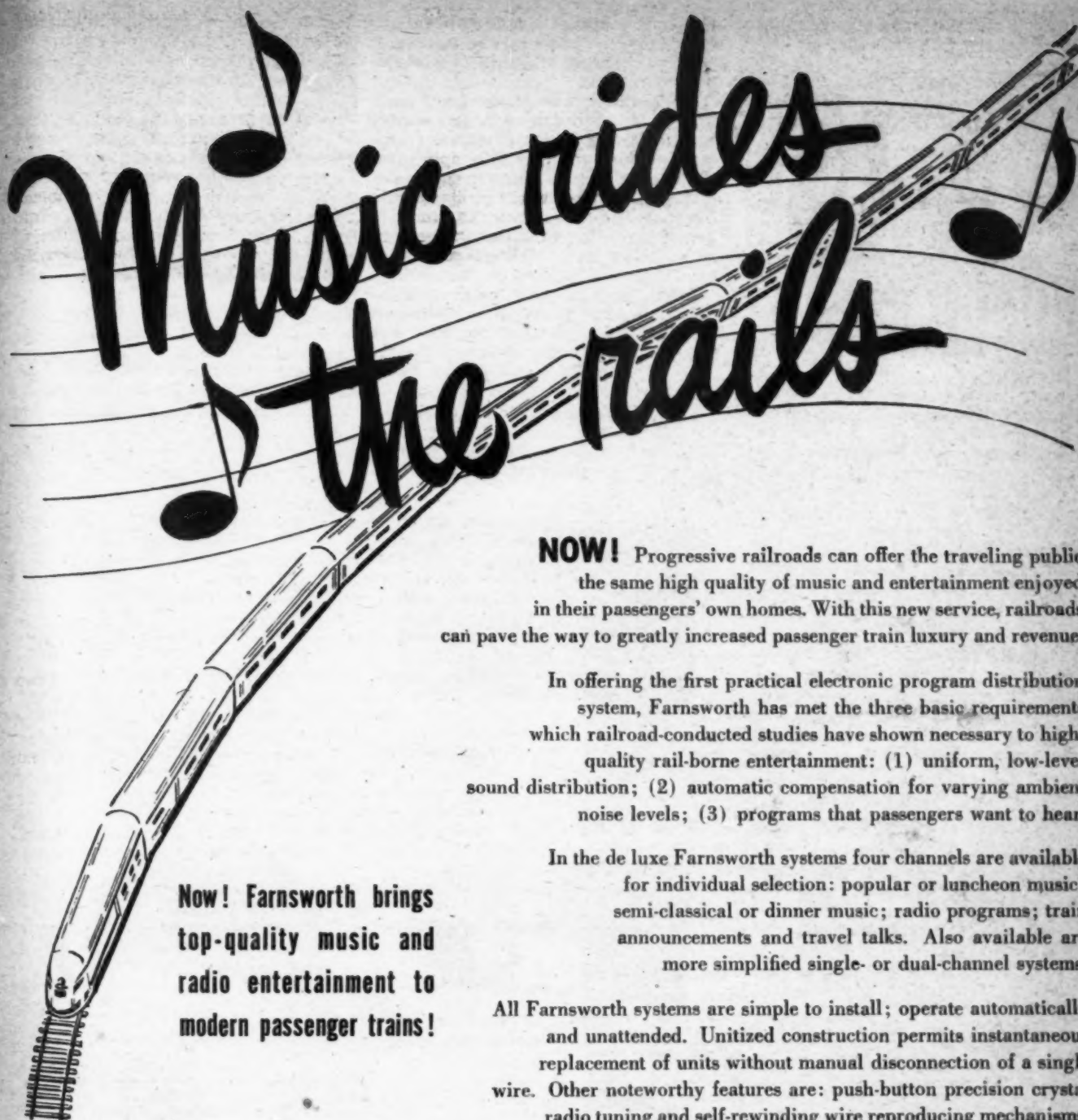
The 24-hour dial of the Robot has two pointers which can be set to turn appliances on and off at specified times. The unit is about 3" wide and 5" high. It comes in a metal and plastic case. The cord attached to the timer may be plugged into any electric wall socket, then the lamps, radios, refrigerators, and other appliances are then plugged into the socket in the device and are actuated at the desired time.

Miller-Harris Instrument Company, 1434 West Atkinson Avenue, Milwaukee 6, Wisconsin, will furnish additional details of this timing switch.

BATTERY CHARGERS

Mellaphone Corporation has introduced an item of interest to servicemen who specialize in auto radios.





**Now! Farnsworth brings
top-quality music and
radio entertainment to
modern passenger trains!**

NOW! Progressive railroads can offer the traveling public the same high quality of music and entertainment enjoyed in their passengers' own homes. With this new service, railroads can pave the way to greatly increased passenger train luxury and revenue.

In offering the first practical electronic program distribution system, Farnsworth has met the three basic requirements which railroad-conducted studies have shown necessary to high-quality rail-borne entertainment: (1) uniform, low-level sound distribution; (2) automatic compensation for varying ambient noise levels; (3) programs that passengers want to hear.

In the de luxe Farnsworth systems four channels are available for individual selection: popular or luncheon music; semi-classical or dinner music; radio programs; train announcements and travel talks. Also available are more simplified single- or dual-channel systems.

All Farnsworth systems are simple to install; operate automatically and unattended. Unitized construction permits instantaneous replacement of units without manual disconnection of a single wire. Other noteworthy features are: push-button precision crystal radio tuning and self-rewinding wire reproducing mechanisms.

Farnsworth Passenger Program Distribution Systems have been engineered by the same laboratories that gave the world its finest instrument for musical reproduction — The Capehart.

Farnsworth Television & Radio Corp., Dept. RN-12, Fort Wayne 1, Indiana.

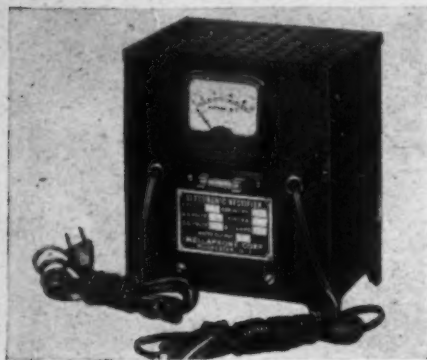
Farnsworth
Television • Radio • Phonograph-Radio

Farnsworth Radio and Television Receivers and Transmitters • Aircraft Radio Equipment • Farnsworth Television Tubes • Holstead Mobile Communications and Traffic Control Systems for Rail and Highway • The Farnsworth Phonograph-Radio • The Capehart • The Panamuse by Capehart

December, 1946

83

Currently available are the company's 6 and 12 volt selenium plate battery chargers which may be used



to charge car radio batteries, serve as battery eliminators on dealer display tables or for supplying d.c. for car radios, thus eliminating the necessity for cumbersome storage batteries.

The chargers come complete with cords, clips and plug ready to use. They operate on 110 volts, 50/60 cycles a.c., but may also be had in 220 volt, 50/60 cycle a.c. sizes.

Complete details of these units will be supplied by *Mellaphone Corporation*, Rochester 2, New York.

BATTERY TESTER

E. W. Ehmann Company of Geneva, Illinois is introducing their new "UKO" battery tester which is designed to provide radio servicemen with a simple and easy-to-operate unit for service calls or shop use.

Capable of handling 90, 67½, 45,

22½, 9, 6, 4½, 3, and 1½ volt batteries, this unit features simple calibrations which may be read by the customer, thus stimulating the sale of replacement batteries.

Housed in a case measuring 6"x4"x2", this unit is operated by one master control switch which covers the nine most popular voltages by simply turning the pointer to the voltage under test. Each instrument is equipped with internal resistance loads to simulate actual operating conditions. The cord is 30 inches long, with red and black insulated test prods.

Prices and delivery dates will be furnished by *E. W. Ehmann Company*, Box 123, Geneva, Illinois to those who request this information.

MECK RECEIVER

Featuring a new method of sensitivity and acoustic compensation control, the new Model 6A6, six-tube (including rectifier) receiver has been an-



nounced by *John Meck Industries, Inc.*, of Plymouth, Indiana.

The new "Sensitone" feature enables

the user to adjust the sensitivity of the set to the noise conditions in his immediate area. A second control, the "Acoustic Compensator," permits adjustment of the bass note reproductions, without loss of distortion of high notes, according to the manufacturer.

Both tone and gain controls are located at the back of the set and once adjusted will not require resetting.

This receiver comes in a choice of wood or ivory finished plastic. Information on this receiver will be furnished by *John Meck Industries, Inc.*, Plymouth, Indiana, to those requesting it.

-30-

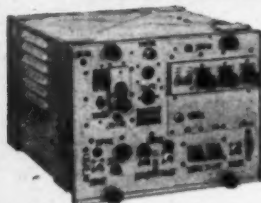
The "Spindle Eye"

(Continued from page 34)

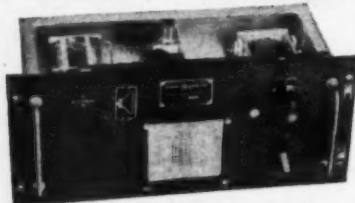
ships and shore telephone systems via the AN/TRC-1 Radio Link. Between the master control room and all strategic points aboard ship such as the recording and photographic laboratories, the monitor receiving room, v.h.f. and standard transmitting rooms and the telegraphic section standard *Tele-talk* "Squawkbox" service was provided.

The ship's antennas were supported between three masts topside, the receiving antennas being confined between the mid and fore masts, while the transmitting antennas were supported between the mid and aft masts. The a.c. power for all signal equipment was provided by two 100 kw., three-phase, 220 volt, deisel-driven genera-

HERSHEL'S LOW PRICED SPECIALS



Transmitter and receiver Navy BN1-FF. The famous boat anchor just released from the Government for surplus. The set has been widely used on the 144 MC band. It can now be used as a transmitter and receiver. Shpg. wt. 100 lbs. Your price \$14.95 less tubes and power transformer.



Tuning unit B. C. 375. Each unit has three double spaced tuning cond. Approximately 65 MMFD. Coils SW chokes national velvet dials and assorted Mica cond. 2500 WVDC over \$50.00 in parts.



Dyna Motor power supply—input 6 or 12 V., output 500 VDC at 160 MA. mounted on box with circuit breaker, relay, interference filter and two 10 ft. cables. Army surplus. Shpg. wt. 84 lbs.

TUBES	
832.....	\$4.95
955-9004.....	.65
Sockets for Acorn Tubes.....	.24
VR 150 Voltage Regulators.....	.49
CONDENSERS—FILTER	
6J6.....	1.50
8J4.....	.95
8 M.F.D.—600 W.V.D.C. Oil Paper Round Can.....	1.95
4 M.F.D.—600 W.V.D.C. Oil Paper Round Can.....	.95
1 M.F.D.—1000 W.V.D.C. Oil Paper Square Can.....	.89
1 M.F.D.—3000 W.V.D.C. Oil Paper Round Can.....	.95
8-8 M.F.D.—350 V.—20 M.F.D. at 150 V.—Can.....	.69
8-8 M.F.D.—475—W.V.D.C. Micamold ..	.69
20 M.F.D.—250 V. Non Polarized.....	.49
BLEEDERS	
75 M. OHM—200 Watt.....	.49
2500 OHM—100 Watt Adj.....	.49
TRANSFORMERS	
6.3 V.—6 Amps. 110 V.A.C.—60 Cycle..	\$1.49
6.3—4 Amps.—750 C.T. at 150 Ma....	3.95
6.3—3 Amps.—600 C.T. at 100 Ma....	1.95
Coaxial Cable—Rg. 54 A/U—58 Ohm per Ft.....	.06
Amphenol Coax Fittings—Male—35c—	
Female.....	.25



Condenser oil filled, hermetically sealed, 8.5-8.5 M.F.D., 1000 V.D.C., convertible to 4.25 M.F.D., 2000 V.D.C., 5¼" long, 2" wide, 5" high..



A wonderful coil which can be used on high frequency Aluminum can. 30 MC, I.F. trans. silver slug tuned.....

Mica capacitor .002 M.F.D., 3000 V.D.C., 2.5 Amp., 300 K.C.....

(20 per cent deposit on all C.O.D. orders.)

HERSHEL RADIO COMPANY

5249 Grand River, Detroit 8, Michigan.

CONDENSERS	
100 M.M.F.D. Variable A.P.C.—Type—	
Silver Plated.....	.59
30 M.M.F.D. Variable A.P.C.—Type—	
Silver Plated.....	.25
12 M.M.F.D. Variable ¼" Shaft.....	.30
Neutralizing Condenser for (250 Th.) Johnson.....	.95
12 M.M.F.D. Vacuum Condenser—20,000 V.D.C.....	3.95
¾" and ½" Powdered—Iron Slugs—	
6-32 Screw Shaft.....	.10
Hallcrafters Tuning Knobs—5 X 28.....	.29
Hallcrafters Volume Knobs—5 X 28.....	.13
25 Watt—210 Johnson 4 Prong Porcelain Socket.....	.39
Pots.—Screw Driver Shaft—2 Meg.—	
1 Meg.—150 M.—50 M.—25 M.—	
5 M.—2 M.—200 Ohm—Ea.....	.29
BC 610 HT4—Tuning Units—ECO or XTAL IN STOCK—2 to 2.5 MC.—2.5 to 3.2 MC	
5 to 6.34 MC.....	1.95
8 to 12 MC.—Diagrams Furnished.....	.25
SOCKETS TO MATCH.....	
0-50 Micro. Amp. Meters 0-1.2 Scale—	
Amsco. DeJur 312.....	9.50
Flexible Coupling—15,000 V. Insulation—	
¼" to ¾" Shaft.....	.49
144—MC. Radar OSC. uses—15 E or HY 75 Tube. Enclosed Silver Plated Tank and Variable Couplink. Complete—	
Less Tube.....	3.95
Selsyn—Motors—2 for.....	3.95



When this Bell Laboratories chemist turns the stop-cock he raises a column of mercury to trap a micro-sample of gas evolved from a specimen of copper. Later he will analyze the sample by micro-techniques.

Trapping poisons by micro-chemistry

Touch of a finger-tip—or even the dust in apparently clean air—can carry enough contamination to ruin an electron tube. Bell System scientists found this out through micro-gas analysis using new and original techniques.

They determined what could destroy the tube cathode's power to give off electrons, and how much—to the millionth of a gram. Then, with Western Electric, they developed a manufacturing technique to keep these destroyers out of

the tubes. . . . Bell Telephone Laboratories scientists established the world's first industrial micro-chemical laboratory more than 16 years ago for the Bell System.

Today micro-chemistry is constantly at work, helping to raise still higher the standards of telephone service and performance.

BELL TELEPHONE LABORATORIES





ARMY-NAVY
Official
HEAD PHONES
\$2.49



BURSTEIN-APPLEBEE
Made A Lucky Buy

Limited quantity of these fine brand new head phones. Highly sensitive, 8000 ohms impedance. Bi-polar magnets, bakelite shell and cap. Adjustable head band, leather covered spring steel. Cord connects from one side, out of the way. Molded sponge rubber ear cushions. Our price only \$2.49 per set plus 20c postage and packing charges. Retail value \$13.50. Order Number 17A37.



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FREE CATALOG**

Latest developments in radio and electronic parts and devices, newest ham gear, gadgets, bargains, war surplus items . . . get this red hot bargain catalog FREE.

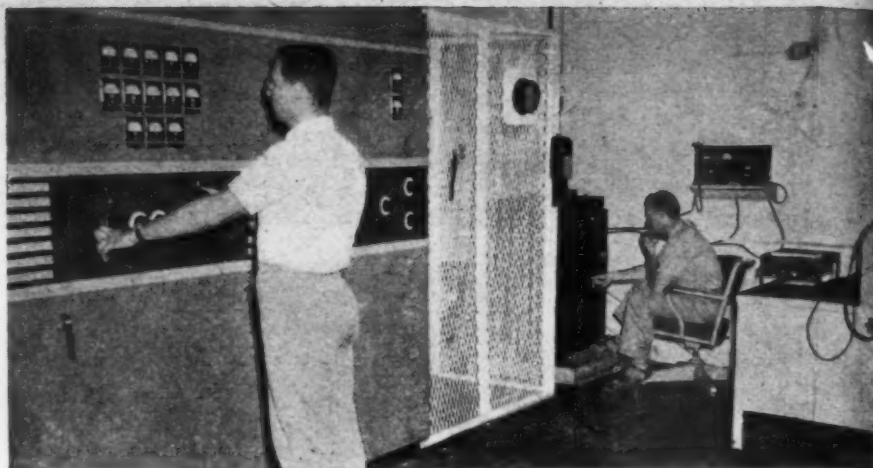
**18 YEARS
IN
RADIO**



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1012 McGee St., Kansas City 6, Mo.

Send me your new FREE Catalog.
Send me _____ pair of phones at \$2.49
per pair plus 20c pair postage. I enclose
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NAME _____
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TOWN _____ STATE _____



RCA 7.5 kw. broadcast transmitter installed in the main transmitter room aboard the "Spindle Eye." Hallicrafters BC-610 500 w. transmitter was used between Kwajalein and Bikini as local order circuit for Admiral Blandy's net.

tors, with a small 15 kw. motor generator set as auxiliary, to be used only for operation of receiving and monitoring equipment when the transmitters were not in operation.

A series of photographs made of the exterior and interior of the "Spindle Eye" during Oliver Read's (Editor of RADIO NEWS) visit to the "Spindle Eye," at Kwajalein in the Marshall Islands, show the various installations described above, and speak for themselves.

As mentioned previously, the "Spindle Eye" was dispatched to Kwajalein and was designated responsibilities of handling all voice broadcasts, press dispatches and radio photos filed by the various broadcast and press representatives based at Kwajalein, and to serve as a standby to the administrative communication facilities installed in

the joint communications center on the island. For the purpose of Operation Crossroads her call letters WVLC, were changed to NIGF. During the early days of our tests and rehearsals considerable difficulty was experienced in putting a consistently reliable signal into RCA at San Francisco, and Press Wireless at Los Angeles which was attributed to the peculiar orientation of our transmitting antennas. The antennas, of course, were limited to the standard delta-fed doublet, which have the characteristic of radiating the maximum signal at right angles to the antenna.

Because of the prevailing winds in the Marshall group, which are indicated on the chart (page 34, September RADIO NEWS) ships at normal anchor, that is standard bow anchor,

**FCC SLASHES FORMS AND OTHER PAPER WORK
FOR LICENSE APPLICATIONS**

To further speed handling of its postwar work load, the Federal Communications Commission is paring forms and other paper work to the barest minimum consistent with administrative requirements.

Of particular interest to applicants and licensees are condensed versions of forms required for new or modified radio facilities. For example, the Commission has adopted, and is about to issue, FCC Form 401-B for police, fire or forestry radio station construction applications. It comprises a single page as compared with the four double pages of its predecessor (FCC Form 401). The present 13 questions all appear on one side of a single letter-sized sheet, with brief instructions on the reverse. The old form spread 34 questions over eight pages.

On the press is a new application (FCC Form 401-C) for the utility or miscellaneous radio services. This has been boiled down to 13 questions on a single page in contrast to 34 questions covering eight pages on the old application (FCC Form 401).

In current use is another dehydrated form (FCC Form 404-A), which supplants FCC Form 404 for non-scheduled aircraft station license. A 5 x 8 inch card distills 15 questions which formerly required four pages. This card form is, in effect, a combination application and license. In other words, a section of the filled-in application is photographically reproduced on the license to expedite processing and delivery of the latter.

Another form (FCC Form 501-A), now being printed, does the same thing for radiotelephone-equipped ships. This, too, is a 5 x 8 card which permits the license to be issued photographically.

The application form for amateurs has not only been revised, but the preparation of individual records for this largest single group of licensees has been reduced from seven typing operations to one by the use of fanfold cards.

Also in preparation are simpler applications for broadcast and other authorizations. Details will be announced when these are ready for issuance. The Commission feels that it can simplify forms to a degree that will meet legal and engineering requirements yet, at the same time, be mutually convenient in reducing work in filling out and processing.

Other short cuts lately put into effect to save time and effort on the part of applicants as well as the Commission may be summarized, in general, as follows:

Extending licenses by blanket order or in blocks when possible to do so.

Making modification of licenses in certain categories effective for the next full license period, particularly in the case of aviation ground stations whose licenses expire on a common fixed date.

Renewing special temporary authorizations without reissuing the documents.

Terminating the requirement that operators furnish fingerprints and evidence of citizenship. Granting third class radiotelephone operator permits on declaration instead of examination.

Relinquishing permit requirements for operators of some classes of mobile transmitters. Making it possible for aircraft radio operators to obtain permits at their home airports.

Discontinuing the requirement that specific transmitters be designated for communications systems and, instead, authorizing their use in specified numbers.

Abandoning designation of serial numbers in cases where a transmitter is replaced by another of the same type.

Terminating registration of diathermy apparatus, amateur transmitters, and unused transmitters which are not required to be licensed.

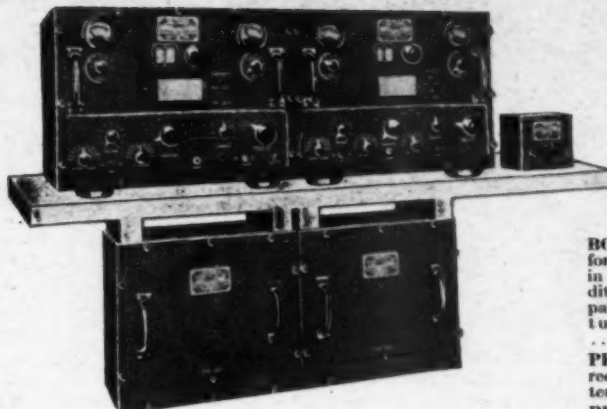


ESSE - SPECIALS



Rectifier Units RA-63-A—Use for battery charging—auto radio operation, etc.

110V, AC—12V, DC—5 amp. . . \$16.75
110V, AC— 6V, DC—5 amp. . . 18.75



Brand new RAK-8 and RAL-8 radio receivers. Built by the Magnavox Company for U.S. Navy. Tubes used: 1st and 2nd R-F 6D6's; detector—6D6; output limiter 41; audio output 41; 1st audio 6D6. Power supply: 5-3 rectifier; 874—voltage regular; 876 current regulator.

Both receivers complete with individual power supplies and remote control unit. Shipped in original over-seas containers, wt. 250 lbs; 110 V-AC. . . . \$225.00

RAK-8 separate-tunes 15-600 KC. Shipping wt. 69 lbs. . . . \$65.00

RAL-8 separate-tunes .3-23 mc. Shipping wt. 74 lbs. . . . \$125.00

CMX-20131-A Power Unit separate, shipping wt. 41 lbs. . . . \$20.00



BC-654-A—Receiver and Transmitter for frequencies 3800-5800 KC. Used but in good operating and mechanical condition. Worth many times the price for parts. Complete with all necessary tubes. Shipping weight 40 lbs. . . . each \$29.75

PE-104—Vibrator power supply for receiver operation from 6 or 12 V battery. . . . each \$4.75

PE-103—Dynamotor for mobile operation of transmitter from 6 V. or 12 V. supply. Output 500 V. at .160 amp. . . . new \$17.50



AN/PRS-1 Mine Detector. Brand new. Used to locate buried treasure, pipes, etc. Complete less batteries. . . . each \$16.95

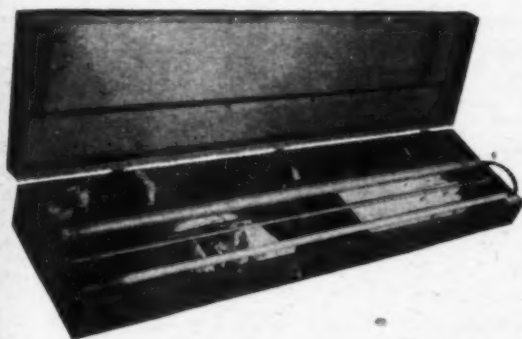


Code Practice Equipment AN/GCQ-1. Brand new. Complete as shown including spare 117N7GT tubes. For 110V-AC operation. . . . each \$12.50

Motorola UHF Antenna for 27-42 mc. Complete with matching sections. 100 ft. Amphenol transmission line, guy wires and shipping box as shown. . . . each \$35.00

BC-406-A Receiver—Brand new. Manufactured by Western Electric. 165 and 205 mc operation. IF frequency 19.5 mc. IF band width .7 mc. Easily converted for operation on other ultra-high frequencies. Operate from 110 V., 60 cycle, A.C. Worth many times this amount for tubes and parts.

Tubes—one 5T4, two 6SJ7, four 6SK7, one 6N7, five 954's, one 955, one 6F7, one 6N7. Also contains small 110 V. operated motor . . . each \$34.50



"Horsie-Talkie" BC-745—Receiver & Transmitter. Portable communications up to 5 miles in 2 to 6 mc. band. Complete with crystals and 9 tubes. Battery voltages required. Receiver: 1.5 V. filament, 67.5 V. plate at 20 ma. Transmitter: 1.5 V. filament, 105-125 V. plate at 50 ma. Chest unit included—shipping wt. 16 lbs. . . . each \$17.50

Power supply unit PE-157 is storage battery operated A and B supply for operation of BC-745. Eliminates batteries and chest unit. Operates from 6 V. external battery or self contained 2 V. rechargeable storage cell. . . . each \$10.00



LAST MINUTE SPECIALS! New Material

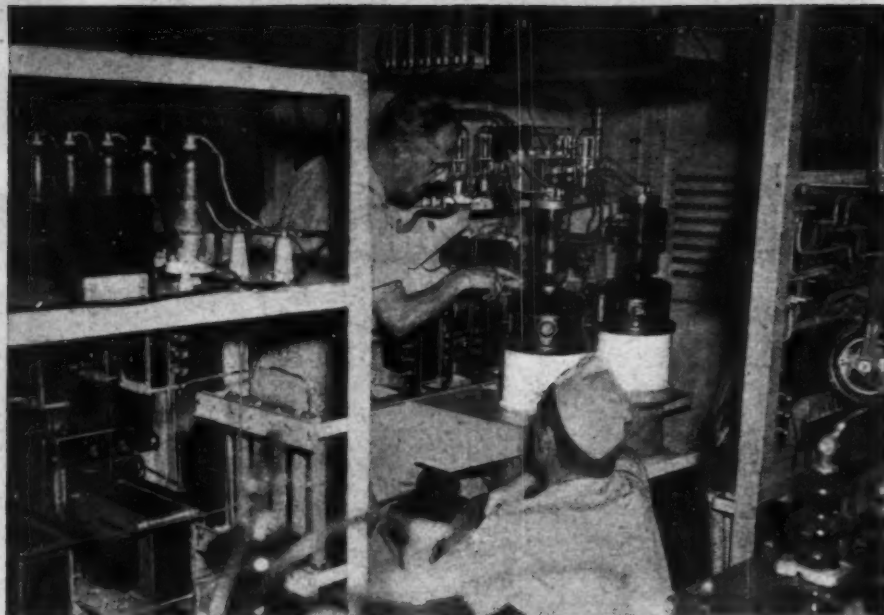
JK-34A Phone Jack for PL 55 plug	\$0.15 each
JK-33A Phone Jack for PL 68 plug . . . . .	.20 each
Amphenol Ceramic Octal Sockets . . . . .	.15 each
Ceramic wafer socket 4, 5, and 6 prong . . . . .	.17 each
Ceramic Coil Form 2" dia. 3" length . . . . .	.15 each
Variable Condenser 15 mmf. . . . .	.25 each
Acorn Tube Sockets—Ceramic. . . . .	.35 each
AN-30 Antennae	1.95 each
Potentiometers: 25,000, 3500, 500, 1500 and 150 ohm valves. All wire wound. . . . .	.35 each
Toggle switch SPST . . . . .	.20 each
Toggle switch DPDT . . . . .	.30 each

[Terms cash with order or 25%, Balance C.O.D. All items shipped collect.]

ESSE

RADIO COMPANY

130 W. NEW YORK STREET • INDIANAPOLIS 4, INDIANA



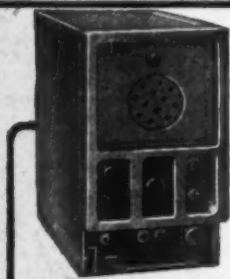
Col. Luichinger explains the salient features of the 7.5 kw. broadcast transmitter to Editor O. Read. Copy which appeared in the August Radio News was sent to the United States over this "Spindle Eye" transmitter.

would lay on a course of approximately 70 degrees, thus setting our maximum signal at right angles to this course, or 160 degrees and 340 degrees. The true great circle course from Kwajalein to San Francisco was 53 degrees, and in order to place our maximum signal lobe on 53 degrees, it was necessary to set the ship on a

course of 143 degrees where she was anchored permanently into position by special bow and stern anchors. To further increase our signal strength to the West Coast it was decided to attempt what was at first termed impossible, that is, the construction of a V antenna, which up to now had always been confined to land based stations

only. Realizing the importance of putting a reliable signal to the United States broadcasting networks, every possible angle was considered. This inverted V, unterminated antenna was constructed by supporting the apex from the midmast of the ship and running the two sides out in the lagoon to anchored buoys. We admitted at the time that the idea sounded rather wild, but felt it was worth a try and the results that were obtained justified this unorthodox construction. A 30% improvement in the signal strength to the West Coast was our reward. The detail of this peculiar construction is shown in photograph (page 32).

Another special construction feature involved in the "Spindle Eye's" function, was our remote receiving station. Because of the high noise level at Kwajalein, as a result both of atmospheric and the mass of interference, to say nothing of the normally high noise level aboard ship, it was difficult to receive reliable cue signals from RCA and Press Wireless on the West Coast. Many times the signal-to-noise ratio was such as to render the State-side signals unreadable. To overcome this difficulty we selected a spot at the extreme northern tip of the island of Kwajalein and set up a remote receiving station. It was possible then to receive the cue signals at all times, fairly free of interference, particularly the electrical disturbances created on and in the vicinity of the ship. These signals were piped out to the ship over

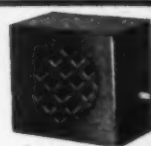


U. S. SIGNAL CORPS 2-WAY TALKING SYSTEM

Made by Western Electric for "Army Tanks." Now you can use them for inter-office communication, house to garage, living room to baby's room, on the farm, and many other places. Volume sufficient to use as public address system. Sensitive enough to pick up your voice 100 ft. from microphone. Sturdy all steel construction. Will take plenty of abuse. (Just plug into 110 volt A.C. line.) Has talk-listen switch, volume control, standard tubes. The small unit is a speaker receiver which can locate up to 1,000 ft. away. Connect as many as 10 speakers. Just plug in and operate. Comes complete with master unit and one speaker receiver unit. O.P.A.

Approved

Extra speaker receiver unit



\$34.50

\$5.95



HS-30 HEARING AID TYPE HEADSET

Hi-fidelity, flat, from 100 to 10,000 cycles, impedance 128 Ohms, will operate across low impedance voice coil. With matching transformer impedance is 8000 ohms. Brand new, complete with plug and transformer...

\$2.98



HS-16 HEADSET

Noise-proof, rubber-cushioned, equipped with 2 matching transformers, magnesium earcaps. A superior headset. 8000 ohms impedance. Brand new...

\$2.98

RA-20 POWER SUPPLY

For Signal Corps receiver. BC-342, output 250 v. filtered DC, 12.6 v. ct @ 3 amps, 12.6 @ 1 amp. Replaces battery pack on BC-312 to convert to 110 volt AC operation, can be used with other receivers. Complete

\$14.89

SINGLE OUTPUT TRANSFORMER

1 1/2" x 1 1/2" x 1 1/2" Secondary impedance, 4000, 250 and 4 ohms

.75

TUBE TESTER FILAMENT TRANSFORMER

11 Windings from 1/2 volt to 110 volt.

\$1.95

Remit 25% with Order! Cash, Check or M. O.

10 LB. CHRISTMAS GRAB BAG KIT

Hundreds of valuable radio parts. Transformers, terminal lugs, coils, wire, condensers, sockets, etc. An excellent gift for the radio-minded young man. Useful items for the radio service technician.



10 LBS. \$1.69

BROADCAST BAND CONVERTER 100 KC to 1550 KC

A valuable unit for owners of Army-Navy surplus receivers, uses a single tube which derives its power from the receiver with which it is used. No wiring necessary with special adapter. The output of the converter connects to the antenna of the receiver. Tried and tested with BC-312, BC-342, NC-100-ASD, BC-779, BC-348, etc. No technical knowledge necessary to connect. Instructions enclosed. In ordering state model number..

\$15.00

THOR ELECTRONICS
5051 N. CLARK ST., CHICAGO, ILL.

**MOST-
OFTEN-
NEEDED**

RADIO DIAGRAMS



Covering 1946, 1942, 1941, 1940, 1939, & 1926-1938 SUPREME PUBLICATIONS LOW-PRICED DIAGRAM MANUALS

Most Popular Models Made By:

Emerson, Motorola,
RCA, Philco, Fada,
Belmont, Sears,
GE, Westinghouse,
Arvin, Wards,
United Motors,
Western Auto,
Majestic, Zenith,
Admiral, Detrola,
Stewart-Warner,
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two spiral-four cables, a standard Signal Corps development, the makeup of which is familiar to most communications people. This cable was placed submarine fashion, merely laid on the bottom of the lagoon, and furnished four physical circuits of excellent quality.

Two additional circuits were obtained by phantoming the two groups. These circuits in this spiral four run also served as remote pickups in future broadcasts on A-Day, when the island telephone cable facilities were used in conjunction with the spiral four circuits to reach the remote points referred to later. These circuits were backed up by v.h.f. radio channels which were only to be used in the case of the cable's failure, the reason for this being that the terrific amount of radio equipment already in operation on the island of Kwajalein and the various ships in the lagoon, including our own high-powered transmitter, created a terrific radio interference problem, and I still sometimes wonder how any of it worked.

As a sample of the kind of a job the "Spindle Eye" did, let's take a look at the A-Day show. Our first duty on Able Day was at 3:30 in the morning, Kwajalein time, when a blow-by-blow description was given by W. W. Chaplin and George Murad of NBC and CBS, respectively, of the evacuation of all unnecessary from the island of Kwajalein to the nearby island of Ebeye. This was a precautionary move by Commodore Wyatt, Commander of the Atoll, against the possibility of an accident in the take-off of "Dave's Dream," scheduled for two hours hence. Our next show was a remote pickup at 5:30 a.m., directly from the starting line of the long B-29 runway at Kwajalein where we carried our portable equipment to the roof of the Operations Building and, with the aid of the remote lines described above, the commentators for NBC, CBS and ABC described the take-off of "Dave's Dream."

Upon the completion of this task we picked up our equipment and headed back for the ship, where we prepared to take our place in the pool show which was to follow immediately after the signal, "Bombs Away."

At 0900 Bikini time the signal, "Bombs Away," not only set in motion numerous unattended electronically controlled equipment, but was also the cue for the big radio show. For the rest of Able Day we were kept very busy. The opening commentary came from the ships in the Bikini area, while we rode the order channel, set up on a low frequency, for coordinating the many pickup points within the test area, awaiting our cue, "Go ahead, Kwajalein." After our participation in the "Pool Show" we had intermittent five to fifteen minute spots throughout the day, with the various networks in the States, covering material originating at Kwajalein.

For the most part all voice shows coming from the "Spindle Eye" were

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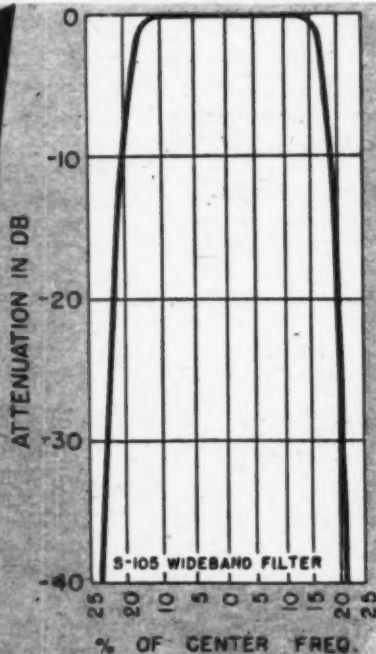
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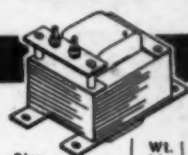
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Close-up of main patch panel and compression amplifier. Capt. Panoff is shown setting up a radio circuit.

on a dual basis, i.e., we modulated both the 7.5 kw. RCA and the 2.5 kw. Wilcox sending our signal to RCA in San Francisco and Press Wireless in Los Angeles on two frequencies. Soon after the planes began returning from the Target area a courier arrived aboard the "Spindle Eye" with the first pictures of the explosion. The order was given to separate the transmitters, the RCA carrying on with the voice shows while the Wilcox was devoted to the transmission of pictures. This called for a little change in operating procedure since all radio photos were relayed through the Army Signal Corps Station WTJ at Hawaii, using channel B of the Signal Corps single sideband system to WVY at the Presidio of San Francisco. So between the voice broadcasts, all of which were recorded as a back up in case of circuit failure, and the transmission of pictures, it is easy to see what I meant by being busy throughout Able Day.

Operating all this fancy equipment aboard the "Spindle Eye" was only a small part of our headaches. Like any large radio station the quality and dependability of its service will be directly proportionate to the maintenance of the equipment. Only on two occasions did we go off the air, once because the overload relays operated (over modulation) and once during a heavy storm when the wind shifted, relaxing the tension on our seagoing "V" antenna, permitting the antenna conductor to dip into the Bay. Both of these failures were only momentary and occurred during unimportant contacts before Able Day.

Immediately following our daily sign off, all equipment from the antennas clear down through the ship to the power units, was checked and tested and any part failing to meet our established standards was replaced. This was a preventative maintenance policy, i.e., get the trouble before it hap-

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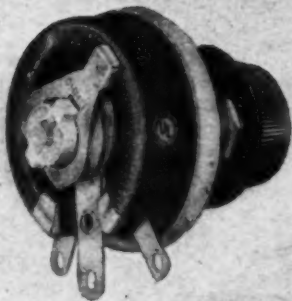
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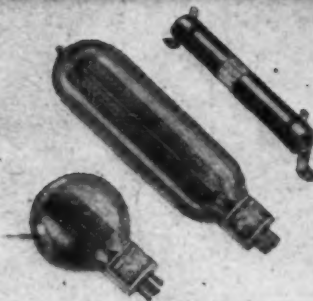
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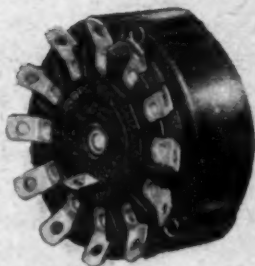
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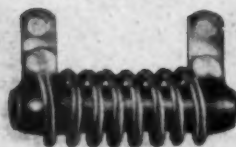
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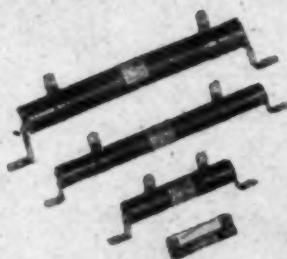
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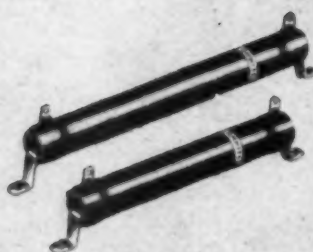
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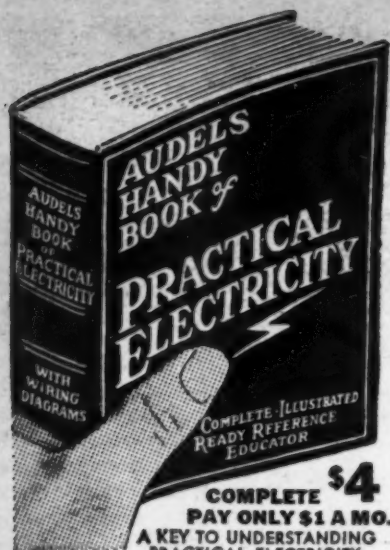
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- ☐ AIRCRAFT WORKER, 240 Pages \$1.
- ☐ MATHEMATICS & CALCULATIONS, 700 Pgs. \$2.
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- ☐ ELECTRONIC DEVICES, 216 Pages \$2.
- ☐ ELECTRIC LIBRARY, 12 vol., 7000 Pgs., \$1.50 vol.

Name _____

Address _____

Occupation _____

Employed by _____ RN

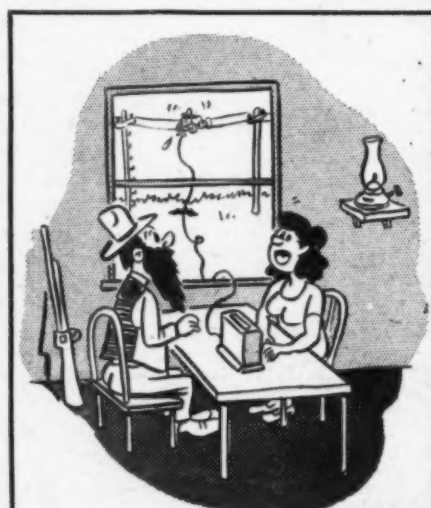
pens and preserve the continuity of the service.

This was a tough schedule to meet, considering the limited personnel with which I was forced to operate and it is entirely fitting to acknowledge here that our success on this operation was possible only because of the high caliber of boys I had with me. They not only possessed the ingenious "know-how" but that eager willingness to carry on in that well-known fashion—unselfish devotion to duty. My operating group was headed by Capt. Shelton "Buck" Weaver of Nashville, Tennessee, formerly of Radio Station WSM, who handled the master control room most of the time himself. Assisting him in these operations was Lt. Jack Panoff, of Brooklyn, N. Y. The recordings and receiving equipment were handled by Lt. Robert Diehl of Milwaukee, Wisconsin, and the transmitters and power by Lt. John Rolfsing of Atlanta, Georgia, and Lt. Robert Dunbar, Hampton, Virginia, and the radio-photo v.h.f. voice frequency telegraph terminal and teletype equipment by Capt. Michael L. Burke, of Indianapolis, Indiana.

As pointed out earlier in this article, the series of photographs made during Mr. Read's visit with us at Kwajalein will tell their own story of the Army Communications Ship, "Spindle Eye" and its fine equipment. To those of us who operated her and to those whom she served I am sure her memory shall always be cherished as the last word in a seagoing broadcasting station, with all the modern frills of a Radio City.

In concluding I would like to acknowledge the many fine letters we received from amateurs all over the United States, letting us know of our strong signals and fine quality. These letters were deeply appreciated by all of us aboard the "Spindle Eye," but time and pressing duties prevented individual acknowledgement. Again I say, speaking for all of the Signal Corps group—thanks a million!

—30—



"This electric toaster is wearing pa out, and the man said it wouldn't be any trouble at all to use!"

Save on this Cabinet!

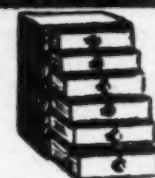


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140 Partition
Heavy Gauge Metal

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Sturdy wood construction. Real value! **3²⁵**

Standard size chassis in stock. Our Metal Dept. will make up special sizes. Give us specs, and we'll quote prices, quick delivery.

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These high quality paper dielectric and oil filled condensers . . . manufactured by Aerovox . . . at rock bottom prices . . . the ideal condenser for coupling, bypass, and tricky electronic circuits where a stable, long-life condenser is required . . . buy them now for future use . . . take advantage of this low price . . . they don't go bad on the shelf.

Capacity	Working Voltage	Aerovox Type
.05	200	260
.1	600	630
.5	400	416
.1	600	616
.25	400	418
.5	600	630
1.	600	630
2.	400	430
1.	600	616
.05-.05-.05	200	230
.1-.1-.1	400	430
.1-.1-.1	600	618
.25-.25	600	630
.1-.1	600	630
.5	400	430

10 of any one type only 98c

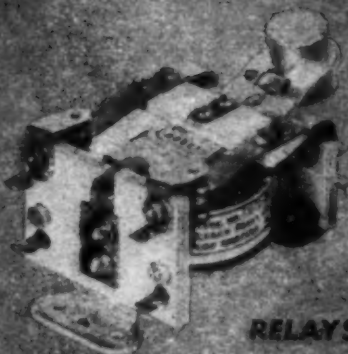
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Built by R.C.A. to exacting standards, this high power modulation transformer will handle a kilowatt class B. The primary is rated at 550 audio watts and matches any class B tube such as an 810, 805, 203, 211, 813, 828, 75T, etc.

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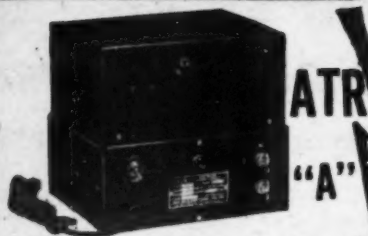
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Name.....

Address.....

City.....Zone.....State.....

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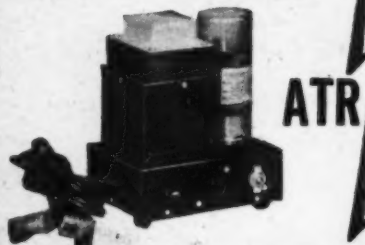


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WRITE FOR NEW CATALOG—JUST OFF THE PRESS!

AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
ST. PAUL 1, MINN. U. S. A.

QTC

(Continued from page 46)

struction subsidy and were for the most part standard Maritime Commission design jobs altered to fit the specific trade routes—production for the vessels in the classes over 2000 tons was nearly normal for a peacetime year. It was pointed out the heavy demand for commercial craft such as towboats, trawlers, ferryboats and other types would probably result in the construction of about 400 of these types before the end of the year.

With the shipping of operators as usual during a marine strike at a very slow pace there has been very little to report this past month in new assignments and arrivals.

THE present strike of the MEBA and MMP unions have the shipping interests of the country tied up again in a complete work stoppage which together with the previous strike of the NMU has kept the ships tied up for some time and many of the boys have been able to get more ashore time home than was expected . . . "Bing" Crosby was in town recently to visit the gang and say hello . . . E. Sepe relieved from his "knot" boat which has been redelivered.

MEMBERS of the physics and electrical engineering departments of the Fenn College, Cleveland, have begun work on a \$13,000 radar project in research for the Army Air Corps it was recently reported.

CONGRATULATIONS to Ed Stetson, father of new daughter . . . C. E. Williams still working with UFCO as is Al Locher. Gene Calavas with new outfit now and thinking of another change shortly. H. Koch reported in 1A under new classification setup. . . . 73

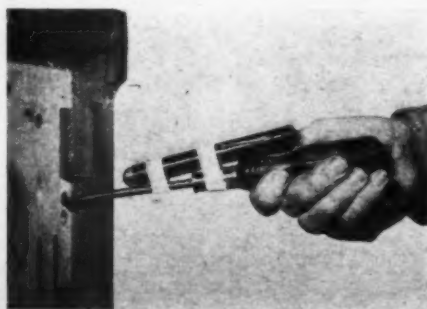
PEN FLASHLIGHT AND SCREWDRIVER

MUCH time is lost in locating the slot in screw heads when the screws are countersunk rather deep, as is usually the case with radio cabinets.

A pen flashlight may be purchased at the dime store and taped to a screwdriver in the manner illustrated.

This attachment will speed up the removing of screws and is worthwhile to keep on the work bench for such use.

H. L.



Superior!



Electronic Voltmeter Ohmmeter

Gives you constant accuracy and guaranteed performance. A stable bridge circuit type vacuum tube meter for measuring AC-DC voltages and ohms. Actual tests establish its superiority. Simple to operate. Hand calibration and hand calibrated multiplier resistors assure constant accuracy and stability.

Measures DC volts up to 600 with constant input resistance of 11 megohms. Resistor in the DC probe permits readings in signal-carrying circuits. Positive or negative indications through a reversal switch. Net price, \$79.00.

Meter Ranges: DC 0-3; 0-30; 0-150; 0-300; 0-600. Multiply by 4 with external probe. AC 0-3; 0-30; 0-150; 0-300. Ohms 0-1000; 0-10M; 0-100M; 0-1 Meg.; 0-100 Meg.

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714 BACE STREET, HARRISBURG, PA.

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T17 CARBON MIKE

Push to talk switch. Cable and 3 way plug. These units are not new, but are electrically and mechanically perfect. A terrific bargain at . . . \$1.15

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.001 Mfd. 8000 V DC Wkg. 9800 V AC Peak. \$3.50
.1 Mfd. 3000 V DC Wkg. 2.00
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KIT NO. 16 CONSISTS OF

2—.1 Mfd.; 1—.05; 1—Dual .5; 1—Dual 1; 1—.01; 2—Dual .1; .02; 2—.02.

All paper oil filled 600 V DC Wkg. Brand new Navy Spare parts. Boxed. Complete. . . . \$1.50

KIT NO. 17 CONSISTS OF

2—.1; .01 Mfd. Dual.

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Paper oil filled—400 V DC Wkg.—Navy spare parts. Boxed. Complete. 75c

Write for specials on other kits.

25% deposit required on all orders. Prompt delivery assured.

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SYLVANIA NEWS

RADIO SERVICE EDITION

DEC. Prepared by SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946

ONE

DEVICE NOW USED BY RADIO SERVICEMEN FOR GREAT VARIETY OF TESTS

Electrical Measurements Made Easy With New Sylvania Unit!

The SYLVANIA POLYMER



Radio servicemen now can use the new Sylvania Polymer type 134 to facilitate a multitude of electronic measurements and tests to radio equipment.

This product of Sylvania Research is stabilized against errors due to voltage variations or gas current in tubes. All accessories included. See your Sylvania Distributor.

CHARACTERISTICS AND SPECIAL FEATURES

Tests audio, A.C. and R.F. voltages from 20 cps to 300 mc through use of proximity fuze-type tube built into handy probe. Full scale range of 3, 10, 30, 100, 300.

Measures D.C. from .1 to 1,000

volts in full scale ranges of 3, 10, 30, 100, 300, 1,000.

Measures D.C. current from .1 milliampere to 10 amperes in full scale ranges of 3, 10, 30, 100, 300, 1,000 milliamperes and 10 amperes.

Measures resistance from $\frac{1}{2}$ ohm to 1,000 megohms in full scale ranges of 1,000, 10,000, 100,000 ohms and 1, 10, 1,000 megohms.

ACCURACY

D.C. ranges $\pm 3\%$ of full scale.

A.C. ranges $\pm 5\%$ of full scale up to 30 volts and $\pm 7\%$ above 30 volts.

R.F. ranges $\pm 5\%$ of full scale up to 10 volts; $\pm 7\%$ from 10-100 volts; $\pm 10\%$ on 300 volt range.

Ohms $\pm 6\%$ to the left of $\frac{1}{2}$ scale; $\pm 13\%$ to the left of $\frac{3}{4}$ scale.

Current $\pm 3\%$ of full scale on all but 10 ampere scale which provides $\pm 5\%$ of full scale.

INPUT IMPEDANCES

R.F. ranges—2.7 megohms resistance shunted by approximately 3 mmf. capacity.

A.C. ranges—2.7 megohms resistance shunted by approximately 40 mmf. capacity.

D.C. ranges—16 megohms resistance.

Remember the Sylvania Polymer type 134. It's beautifully styled, compactly designed, has easily read meter and dials.

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Emporium, Pa.

MAKERS OF RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS; FIXTURES; WIRING DEVICES; ELECTRIC LIGHT BULBS

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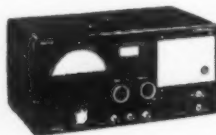
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Address.....

City.....Zone.....State.....

LETTERS

from our readers

HE STARTED SOMETHING

"I HAVE just read the letter by Roger Harris in the September issue of RADIO NEWS denouncing the class D license, the test for which is to be the same as that for the class B, less the code test. I quote one paragraph from his letter. 'Personally I believe that the thousands-of-highly-skilled-persons story is a myth. My experience during the war was that most of these so-called experts worked with a technical manual in one hand and had little knowledge of what made the wheels go round. The exception in almost all cases were those who had been in radio long before the war.'

"I am not a ham and have no intention of becoming one in the immediate future, hence I have no personal interest in the proposed class D license. I must, however, take exception to the above-quoted paragraph, as my experience, and those, I am sure of thousands of others—was just the opposite.

"I can't speak of the Army's Radio training for I was in no way connected with it, but I should like to defend the Navy's Radio Technicians Training Program. This was a year-long intensive course in the theory and practical application of all phases of radio and electronics. Very few of the students had ever done more in radio than to turn on or off his home receiver. Did we hold a schematic and parts list in our hands while servicing? Of course! Who doesn't, when they are available?

"I have no special love for the Navy—I'm glad to be a civilian again—but in all fairness to the rest of my fellow ex-Navy radio technicians, I must say that a great many of them who do not know the code are technically qualified to operate transmitters. Why make them learn the code to get their license, even though they will never make use of this code."

J. Wensler
St. Louis, Missouri

RECORDING EQUIPMENT

"I WAS very pleased to read on page 154 of the September, 1946 issue, two letters from readers under the heading 'Recording Series.'

"Due to the kindness of a friend in the New World, I have been a subscriber to RADIO NEWS for the past 1½ years. My main interest is disc and all forms of recording and is the reason I obtain your magazine. During the time I have been a reader very little has been printed on the subject, and few adverts have appeared even to whet my appetite for the fine apparatus available in U.S.A. which is denied a growing recording public in

this country by British manufacturers and the Board of Trade Import Department. I have spent some \$20.00 obtaining photo copies of your articles from 1941 and through the courtesy of two U.S. firms received their catalogs. I hope if this letter reaches the eyes of other firms or amateur recorders they will send me details of their apparatus.

"I therefore look forward excitedly to the new series of articles and the new book you mention.

"In conclusion, a word of high praise for the quality of your excellent journal, and the varied and extremely interesting matter contained therein, which is far superior to any similar journal printed in this country—which is certainly not due to any lack of support by readers and amateurs like myself."

E. B. Cullin
Member, British Sound
Recording Association
92, Victoria Road
DISS
Norfolk, England

Here's another prospect for your makers of recording equipment.

LICENSING REQUIREMENTS

"IN YOUR September issue, the article by Comdr. S. Freedman and also the letter concerning the 'D' class license on page 154 indicates that it is possible to obtain a license and call letters for v.h.f. broadcast by simply applying for same.

"I am very much interested in experimental electronics and desire to operate under the condition outlined in these articles.

"However, I desire a more clear cut expression of the facts and all up-to-the-minute information which would permit me to operate either with or without a license."

David P. MacArthur
Syracuse, New York

"NOTICE in your magazine an article by Comdr. S. Freedman, 'Two-way Radio for Everyone.' He spoke of operating without license.

"I would like to know if any kind of transmitter, such as the war surplus 'handie-talkies' or 'walkie-talkies' can be bought and operated without a license."

Joe Tisdale
Tisdale's Radio Service
Benton, Ark.

"I WOULD like to find out where I can secure the following information: License regulations and rules for two-way operation in the Citizens'



"Cardyne" Cardioid Dynamic
Models 731 and 726



"Cardax" Cardioid Crystal
Model 950



Bi-Directional Velocity
Models V-3, V-2, V-1

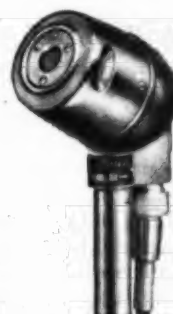


Differential Carbon
Hand-Held Model 205-S



Model 610 Dynamic
Model 910 Crystal

No finer choice than
Electro-Voice
TODAY'S MOST COMPLETE LINE OF
MICROPHONES



Differential Dynamic
Model 606



High Fidelity Dynamic
Model 630

WITH important E-V developments such as the *Mechanophase* Principle*, the *Differential† Principle*, the *Aconstalloy Diaphragm*... ELECTRO-VOICE brings you the widest selection of quality microphones, for both general and specific applications. In the complete E-V line of uni-directional, bi-directional, and non-directional types, you can easily find exactly the right microphone to give you the sound pick-up and reproduction you want. A few models are shown here. ELECTRO-VOICE engineers are glad to help you on any special problems. *Send now for new E-V Catalog No. 101.*

*Patents Pending †Patent No. 2,350,010
Crystal Microphones Licensed under Brush patents.



Hand-Held Dynamic Model 600-D
Differential Dynamic Model 602



Versatile Dynamic
Model 640



General-Purpose Dynamic
Model 605



Differential Handset
Model 260 Carbon, Model 660 Dynamic



Comet Crystal
Model 902

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Buchanan, Michigan

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HEAT in 6 SECONDS
with the
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YOU AIM IT AT YOUR WORK
with a restful, natural wrist position

Engineered for every type of soldering, the Flash Soldering Gun gets around corners and into minute places. Heats only while pressure is on trigger—intensity of heat controlled at your finger tips. Equipped for immediate operation from our 110 V transformer, or from any standard (6-12V) storage battery in car, tractor, airplane, boat, etc. Ask about extra tips for special work, and for specifications for the heavy duty model, with its $\frac{3}{8}$ inch tip. See your distributor, or send coupon.

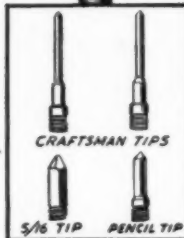
BAKER-PHILLIPS COMPANY

2816-1 Aldrich Avenue So.
Minneapolis 8, Minnesota

Please send circular on Flash Soldering Guns.

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Address _____

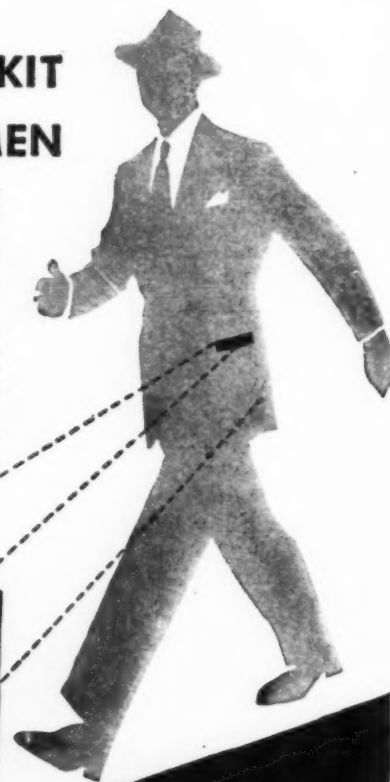


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Colorful, convenient, compact... the Saleskit slips easily into your pocket. Take it on service calls. It contains 3 Jensen Concert Needles retailing at \$1 each and 3 Jensen Genuine Sapphire Needles at \$2.50 each.

Available NOW at your jobber. WRITE TO-DAY for complete details and our better than usual discount to servicemen.



JENSEN INDUSTRIES, INC.
331 SOUTH WOOD STREET
CHICAGO 12 ILLINOIS

radio band; where to apply for license and secure any license forms for applications.

"This two-way system was described in the September issue of RADIO NEWS."

Eugene Cheney
Cheney Electric Service
Nora Springs, Iowa

For clarification on the licensing status, please turn to page 58. The FCC has kindly summarized the provisions for operating above 25 mc. for the benefit of our readers.

TUBE COLLECTOR

"I HAVE been a subscriber to RADIO NEWS since 1923 and have recently become interested in tube collecting as a hobby. I find that I am in a poor geographical location as far as access to cities likely to have the early equipment.

"In looking over some past issues of RADIO NEWS, I note a column in the March, 1943 issue on "The Tube Collector." I wonder if any lists of people who may have early tubes for sale or trade are still available. I am also interested in early radio receivers such as the DeForest honey-comb coil receiver and early wireless equipment. Any suggestions that you may have to offer will be appreciated."

M. D. Stahl
426 Westler Avenue
North Canton, Ohio

If any of our readers have early tubes and radio equipment which they would be willing to sell Mr. Stahl for his collection, please write to him direct.

TREASURE FINDERS

"I ENJOYED the article very much that appeared in the September issue of RADIO NEWS on treasure locators.

"I would like to add a postscript to that article about locating oil by the use of treasure locators.

"Having done quite a lot of geophysical prospecting with about every kind of instrument used to locate geological structure and with the following data to back me up, I will make the statement that there is no instrument in existence today that will find oil directly. There are many instruments today that will locate salt domes, faults, plugs, and outcrops, but not oil.

"A great many of the resistive methods read the conductivity of the top soil but very few read the resistance of the deeper structure.

"The use of treasure locators to determine a prospective point to drill for oil does have some merit only insofar as the treasure locator will indicate the mass density of the soil at the surface of the ground near the instrument. This is not a bad method as it will indicate the weight of the soil in terms of conductance.

"It has been found that when soil samples are dried and sifted and weighed the graph derived from these weights will coincide with the graph made with the treasure locator. The

RADIO NEWS

WHATEVER YOU NEED IN RADIO OR ELECTRONICS

PARTS...SETS...KITS TESTING EQUIPMENT...TOOLS PUBLIC ADDRESS EQUIPMENT TRANSMITTERS

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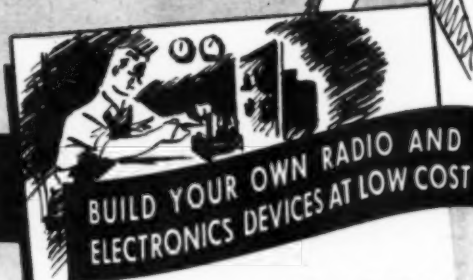


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Order from LAKE!
You'll Make No Mistake!

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NOW AVAILABLE!
Postwar 2 Post RECORD-CHANGER

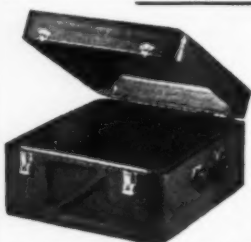
With luxurious brown leatherette case, 15" L. x 15" W. x 10" D. Latest electronic developments make this modern record-changer the finest on the market today!

CHANGER \$18.50
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DE LUXE RECORD-CHANGER and AMPLIFIER CASE

De luxe changer case with ample room for amplifier. Overall dimensions: 20" L. x 10" W. x 10" H. Sturdily built of 3/4" plywood, de luxe brass hardware throughout. Inside dimensions: 15 1/4" L. x 14 1/4" W. x 9 1/4" H.

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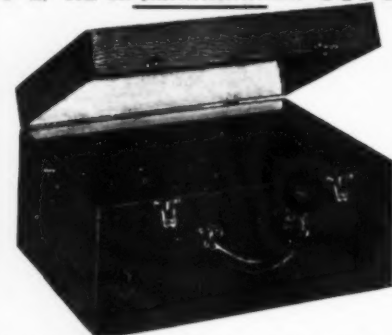


Deluxe PHONO CABINET

Covered in luxurious, genuine brown leatherette, has deluxe brass hardware throughout, made completely of

plywood with brown plastic handle, has padded top and bottom. Motor board 14" x 14 1/4". Overall dimensions 16" L. x 15" W. x 8" H. Your net price.....

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Portable Phonograph case, of sturdy, durable plywood, in handsome brown leatherette finish. Inside dimensions 16 1/2" long, 14" wide, 9 1/2" high. Has blank motor board. As illustrated above, specially priced at.....

\$6.95

Also blank table cabinets of walnut veneer in the following sizes, with speaker opening on left front side: (*Note: *7 has center speaker grill.)

#1 — 8 1/2" L x 5 1/2" H x 4" D \$1.95
#2 — 10 1/2" L x 6 1/2" H x 5" D \$2.75
#3 — 13 1/2" L x 7 1/2" H x 6 1/2" D \$3.25
#7 — 10 1/2" L x 7" H x 5 1/2" D \$2.50

*Speaker Opening in center of front side.



All types of radio cabinets and parts are available at Lake's Lower prices. A large stock is listed in our catalog.

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Lake Radio Sales Co.
615 W. Randolph Street
Chicago 6, Ill.

soil weights over a fault or at the edge of a salt dome are much heavier than the surrounding soil. This is due to the fact that the escaping gases along a fault or along the edge of a dome leave behind the heavy mineralized and oxidized gases as they come in contact with the air. Therefore only the soil near the surface is representative of the structure below.

"Two very important rules should be kept in mind when designing a radio frequency type locator. One, the lower the frequency of the oscillator, the greater the penetration into the earth.

"Two, if two oscillators of the beat frequency type are used, one should be shielded against the variables caused by formation changes.

"You may use any or all of this information for print. I hope that this letter will clarify some of the black magic ideas as to the value of radio locators for finding oil."

John Bender

Geophysical research engineer

Houston, Texas

Our thanks to Mr. Bender for passing on this information for the benefit of our readers.

—30—

International Short-Wave

(Continued from page 58)

Sundays with English news; Bandoeng, 8.000 Java: OC5; FXE, 8.020, Beirut, Lebanon, with English news at 11 a.m.; CKCS; Radio Omdurman; Elizabethville, Belgian Congo, OQ2AB, 11.900, with musical program on Sundays at 8:10 a.m., no English; RNE, Madrid; XGOY, 11.92; Radio Saigon; FZI; ZNB, 5.90, Mafeking, Bechuana-land, musical programs, 6-7 a.m. and 12 noon-2:30 p.m., with SABC English news relay at 12:30 p.m.; and TAP.

American QSL Bureau

"The American QSL Bureau was formed in April, 1939, as a non-profit organization to forward, free-of-charge, mail which was addressed to amateurs throughout the world," explains M. F. Williams, Director.

"No dues nor assessments were levied and the services of the Bureau were available to the SWL as well as to the amateur. Thousands of cards were forwarded via the Bureau and a sincere effort was made on our part that this effort might be a success.

"We are proud of our record and although not all of our subscribers received 100 per-cent results, we feel sure that many an amateur increased the number of countries worked and verified as a direct result of our service.

"Due to the great number of QSL cards previously forwarded by our Bureau and the results obtained, we are desirous of continuing this service during the postwar period, and trust we may again be of service to hams and SWL's alike.

"We regret, however, that in the

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1LB4	\$1.20	76	\$.45
6B8	1.90	832	3.45
6F673	205185
6L782	900285
12Y6GT55	9003	1.15
12SJ750		

REMOTE TELEPHONE UNITS—RM12. Includes handset, hand generator, ringer, Weston 201 rect. type db meter, in crackle finish case. Pairs make fine battery-operated talk system. Used... \$17.95

SIGNAL GENERATOR, I-208, 1.9 to 4.5 and 19 to 45 Mc. Xtal calibrated; Microroller calibrated from 1 to 100,000; built-in speaker; complete w/15 tubes. Operates 110 v. 60 cycle or 12 vdc. New, only one in stock... \$195.00

TUBE & SET-TESTER, Sig. Corps I-56-C or later; Triplett or Espey. Includes tube & set-tester pocket multimeter, pocket output meter, all in metal carrying case. Checks latest tubes. Used, good... \$69.95

EARPHONES, HS-33 Army, 600 ohms, w/earpiece and leather covered headband, used, good... \$1.00; 10 for \$8.50; 100 for... \$65.00

AMPLIFIER, W.E. #107-A w/tubes, used for identifying lines in telephone cable without making actual contact. Used, good... \$35.00

GALVANOMETER, Weston 699 in mount, scale 30-0-30, sensitivity 2 microamps per division... \$7.95

VARIABLE CONDENSER, 500 mmf, National EMC-500, in original boxes, only... \$2.50

TRIMMERS, half-silvered ceramic, 5-20 mmf, 5 for \$1.00, 100 for... \$15.00

HI-CAP. ELECTROLYTICS, 3000 mfd., 3 volts... 35c

RETARD COIL, W.E. #D161634, 85c each, 10 for... \$7.50

NETWORK FILTER, W.E. #D159989, band pass 5 kc. (wt. 2 1/4 lb. packed)... 85c

Postage additional. Minimum order \$2.00.

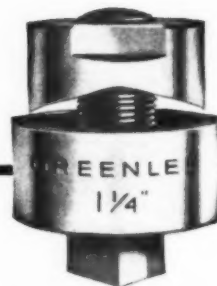
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- at 200 kc for r-f alignment.
- at 1000 kc for short wave alignment.

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CRYSTAL CONTROLLED OSCILLATOR

Finger tip adjustment is provided by a three position modulation selector and a five step attenuator, with vernier output from 0 to 15 volts. An external socket accommodates extra crystals that may be needed for special requirements.

There is nothing complicated about the Bliley CCO. Simply connect it to the receiver to be tested and select the frequency desired. The crystals are instantly on frequency as soon as the oscillator is energized. It will save you hours of time, eliminate guess work and increase your prestige as a radio service technician.

The CCO is a "techniquality" product of the same engineering skill and craftsmanship that have kept Bliley Crystals foremost in dependability in the frequency control field for over 15 years.

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We have on hand a large selection of Radio and Electronic Equipment purchased from the United States Government, and solicit your inquiry on practically any equipment or component parts used by the Army or Navy. Listed below are only a few of the many items we now have on hand.

Amplifiers, All Types

Antenna (RF) Tuning Units, less tubes... \$4.25
Antenna Elements, set of six. Screw in antenna sections approx. 38 inches long, totalling 18 feet, tapering from 9/16 base to 3/16 tip... 3.25
Bulbs, 1/4 watt neon bulbs, screw base... .20
Bulbs, pilot, #44 & #47, box of ten... .50
Cases, receivers, 20 1/4 x 14 1/2 x 11, gray finish... 4.75

Connectors, All Types. Write for Kind Desired
Condensers variable, National Type SSU, heavy duty, 7 plates, 50 mmf... \$2.50
Condensers variable, 365 mmf... 1.15
Fuse holders, screw in top... .15

Insulators, All Types Available
Jewel assemblies, large 45c; small... .30
Phonograph motors... 10.00
Phonograph hook-up wire, 15 foot roll... .25

Plugs, All Types Amphphenol, Phone, Cannon, Etc.
Potentiometers, all types... 35c to 45c
Resistors, asst. of 100—1/4, 1/2 & 1 watt... \$2.25
Relays, IXBM coil, 115 v., 60 cy., will carry 2 amps... 1.75
Sockets, Steatite, 4 prong... .20

Signal Generators
Sockets, Johnson #247 transmitting... .60
Suppressors, spark & distributor... .10
Switches, single pull D, throw... .25
Switches, single pull S, throw... .25
Switches, 4 pole double throw... .65
Tube cap assembly, large transmitting... .15
Speakers, LS-3... 4.95
Oscilloscopes, 3 and 5 inches.

TRANSMITTING TUBES
304TL... \$ 7.00 826... \$ 3.50
250TL or R... 7.00 832... 4.00
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807... 1.00 VT-127 A... 2.25

CATHODE RAY TUBES
3AP1... \$3.50 12DP7... \$12.00
5BP1... 4.95 3GP1... 3.50
5CP1... 4.95 5BP4... 4.95

AND OTHERS
TRANSFORMERS
High Voltage, Kenyon, type S-13336, for Scope, 6.3V.-6A, 2.5V.-1.75A, 2500V.-0.15A... \$5.00
FILAMENT: 115V. 60 cys. sec. (3, 4) 6.4V. at 1 Amp.: 8.1 W. Weco #ESXX-683609; P/O Oscilloscope... 1.30
FILAMENT: Kenyon, type S-13377, 115V. Pri. 5V. CT at 60 amp. sec... 6.00
GENERAL PURPOSE: Power Transformer, Gen. Trans. Corp., type 6J28; Pri. 115V. 60 cys. 3 sec. 300-0-300V; 100MA; 6.3V. at 5 Amp. 5V. at 3 Amp... 3.00

We Have Large Inventory of Power, Plate, Filament, Audio and Others
Send for Special Transformer Flyer
Naval Aircraft Receiver, ARC5, Superhet, Tubes—Included—3—12SK7, 1—12K8, 1—12SR7, 1—12AG7... \$14.95
Naval Aircraft Transmitter, ARC5, 25 Watt CW; 15 Watts Phone. Tubes included; 2—1625, 1—1629, 1—1626, 1—6200KC Crystal Range LESS Dynamotor; Operates on 25V. Power Supply... 17.95
METERS: Weston Model #506, 2 inch, 0 to 150 DC MA... \$3.00
Relays, IXBM-Coil 115V. 60 cys. Will carry 2 Amp... 1.75
Sockets, Steatite, 4 Prong. Dozen... 1.60

SPECIAL GRAB BAG OFFER
Over \$100. Cost of Miscellaneous Radio Parts, etc. Including Pilot Bulbs, Condensers, Resistors, Sockets, Insulators, Fuse Holders, Terminal Strips, Transformer, Volume Controls, and many other articles—A REAL VALUE FOR ONLY—\$10.00.

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future we will no longer be able to forward SWL reports free. Expense involved in mailing thousands of SWL cards can no longer be absorbed by myself. SWL reports will be forwarded when the sender conforms with the rules and regulations of the Bureau. These may be obtained by sending me a self-addressed, stamped envelope. QSL's originating from a licensed amateur station and addressed to a bonafide amateur will continue to be forwarded free. Simply address such cards: Amateur Radio Station —, c/o American QSL Bureau, P.O. Box 7073, Roseville Station, Newark 7, New Jersey."

Mr. Williams points out that the Bureau is the official QSL Bureau of numerous bonafide amateur associations, and that "it is a pleasure to extend the service of the Bureau to readers of RADIO NEWS."

Station Addresses

CE960, Santiago, Chile—"Radio La Americana," Casilla 13155, Santiago, Chile.

OAX4H, Lima, Peru—"Radio Mundial," Apartado 1098, Lima, Peru.

The Swiss Broadcasting Corporation should be addressed at 30 Neuen-gasse, Berne, Switzerland.

Shepparton Plant

Radio Australia, Melbourne, informs me that their line and aerial plant at Shepparton, Victoria, close to Melbourne, consists of steel lattice masts, 210 feet high (no galvanizing, painted only); multi-element directional arrays; 12 miles of 600-lb./mile copper radio frequency transmission lines; 12 miles of U.G. cable; and 1700 poles,

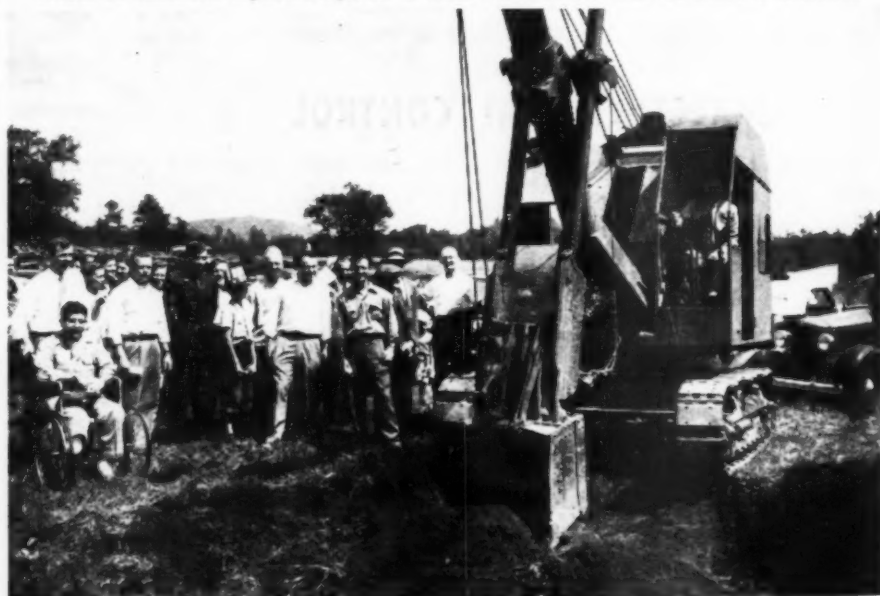
supporting 12 miles of radio frequency transmission line. And it is growing!

Radio Club News

Grand National SWL Club—Officers for 1946-47 are George H. Jacobs, president; Edw. F. Shirley, first vice-president; Merton Meade, second vice-president; Dorothy J. Seiler, secretary. The Board of Directors consists of these officers plus Harold G. Fitzer and Walter C. Downes. Address of this club is P.O. Box 781, Ft. Wayne, Indiana.

URDXC—Announcement has been made of the merger of the *Universal Radio DX Club*, 7507 Holly Street, Oakland 3, California, with the *Victory Radio Club*, of Latrobe, Pennsylvania. The new club will be known as the *Universal Radio DX Club*, its periodical will be the *Universalite*. Short-wave editor of the bulletin and of the short-wave log will be William "Bill" Howe; amateur section editor, Ralph Kastner; BCB editor of bulletin, Erick Johnson; assistant BCB editor of the bulletin, Bruce Kennedy, who will also edit the new BCB log; editor of the bulletin, Charles C. Norton. The new BCB log will be issued three times a year—September, January, May—with each issue a new and up-to-date revision of the previous one. While bulletins will continue to be mailed from Oakland, California, both the SW and BCB logs will be mailed from Latrobe, Pennsylvania. The VRC leaders, or other members of VRC, are to have representation on the Board of Directors of URDXC, either by election or appointment. The combined clubs will probably be the largest organization of its kind in

Ground for the first Honor Village home was recently broken when Tobe Deutschmann took the controls of this steamshovel and the new veteran housing project near Canton, Massachusetts was formally opened. Mr. Deutschmann, president of the company bearing his name, supplied the land for Honor Village at \$1.00 per lot and, in addition, made the necessary credit arrangements for the veterans to build homes with 4 per-cent, 25-year mortgage loans. Cooperating in the Tobe Deutschmann Honor Village project were Eureka-Williams Company who furnished vacuum cleaners and irons at \$1.00 each for the homes; The Hallcrafters Company, who furnished eighteen Model S-40 communications receivers; Sylvania Electric Products Inc., who furnished fluorescent lighting fixtures and bulbs for the homes; and the Lektrolite Corporation which donated Model 50 flameless cigarette lighters to each veteran who was awarded a homesite.





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Vacuum Grip REG. U.S. PAT. OFF. **Pliers**

A complete line . . . engineered for performance

Pliers are basic tools in an extremely wide and varied range of operations. The *right pliers for the job* can make a tremendous difference in speed and workmanship. The Snap-on pliers illustrated are typical of the many types of Vacuum Grip pliers . . . each type *job-engineered* for peak performance on the work for which it is designed.

Snap-on builds Vacuum Grip pliers in a modern plant devoted exclusively to the production of the finest, most efficient pliers that can be produced. Vacuum Grip pliers are hammer forged from special high car-

bon chrome-silico-manganese alloy tool steel, hardened and tempered through and through. Light in weight, perfectly balanced. Smooth, easy riding joints, sharp, deeply milled teeth. Hand filed, perfectly aligned cutters. Spring-tempered, "Vacuum Grip", non-slip handles.

A famed name in Snap-on's complete line of more than 3,000 tools for production and service, Vacuum Grip pliers are available everywhere through Snap-on's nation-wide direct-to-user tool service.

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SP400-X Super Pro. This is the new mode which covers a continuous range in 5 steps from .54 to 30 meg. Complete with Speaker..... **\$347.25**

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Frequencies cover .54 to 31 meg. in 6 steps. Complete with Speaker... **\$173.25**

NATIONAL RECEIVERS

HRO 5TA, complete with Power Supply Speaker and Coils (1.7-4.0; 3.5-7.3; 7.0-14.4; 14.0-30MC).

Additional coils available..... **\$306.70**

NC 2-40D Complete with Speaker... **241.44**

NC 46 Complete with Speaker..... **107.40**

FEDERAL SELENIUM RECTIFIERS

6 to 49 **99¢** each

1 to 5 **\$1.09** each



Quotations on larger quantities gladly furnished.

For Console Radios, AC-DC Portables, Vibrator Power Supplies, Intercom Power Supplies, replaces any 117 Volt Rect. Tube. Replace tube and socket; require less space; facilitate smaller cabinet design, prolong life of set, give immediate rectification. Schematic Application with each order.

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LP-110 Super Selective Systems

The LP-110 System is made up exclusively of Master Stations. With this system any station can call any other station in the system and in addition a number of two-way conversations can be carried on at one time. You can begin with 2 Masters and add up to a total of 10 in the LP-110 System. Each Master..... **\$26.50**

Milo has complete stocks of Nationally known IRC, Aerovox, B&W, Newcomb, Thordarson, Meissner, Tungsol, Weston Supreme, National, SNC transformers, etc. If not rated, 20% with order, balance C.O.D. Dept. N.

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the United States. Further details—including information on dues—can be obtained by writing to the president, Charles C. Norton, at the Oakland address.

This Month's Schedules

Albania—Radio Tirana currently broadcasts on 7.850 to Europe, 2-5:15 p.m.; English news is at 4:15-4:30 p.m.; address, Drejtoria Qendrore E Radioperhapjes Shqiptare, Rue Conference de Peza 3, Tirana, Albania. Mail service to Albania has been resumed.

Algeria—The station heard evenings in the East with a program mostly in Arabic and which has baffled some DXers as to identification is Radio Algerie, 12.115 (listed, but actually at present on 12.118). The Arabic program begins at 5 p.m.; from 4-5 p.m., this station relays the Paris transmission for the British Isles (in English).

Argentina—QRA of LRA5 is furnished by J. T. Jones, Pennsylvania, as follows: Sarimento y Avandia, L. N. Alem, Buenos Aires, Republica Argentina. LRA5, operating on 17.720, is heard well in the East each Friday, 4-4:30 p.m., with English at about 4:11 p.m.; languages used are Spanish, English, Portuguese, and French, in that order.

Another report indicates that LRA, LRA1 (9.690) were announced as also being used. (Ferguson)

Australia—Radio Australia has initiated a weekly DX broadcast of short-wave news from the Australian DX Radio Club; a 20-minute program is heard for North America on Saturday at 8:10 p.m. over VLA9, 21.600, and VLC9, 17.840 (good signal on VLA9, weaker on VLC9); a 12-minute broadcast for Britain is heard on Saturday at 10:45 a.m. on VLB2, 9.680 (fair signal reported by Harrison, England).

The new 100 kw. transmitter at Shepparton has been put into daily service in a number of transmissions, resulting in considerable rearrangement of Radio Australia frequencies. To Eastern North America, VLB ("B") for "boomerang") has replaced VLC5 on 9.540 at 8-9:15 a.m., with VLC7, 11.84, having been added; reception is excellent on either frequency; at 7:30-8:30 p.m., VLA9, 21.600, has been added; it sends a better signal to the East than VLC9, 17.840, the other frequency (this one runs to 8:45 p.m. sign-off). To Western North American between 11:45 p.m. (new sign-on time) and 12:45 a.m., the line-up is VLB8, 21.600, VLC4, 15.320 (the best), VLG7, 15.160, and VLA4, 11.770. (VLB8 is off Friday night.) Saturday morning when it is busy as VLB6, 15.200, to the Australian Forces. To Great Britain at 2-3:15 a.m., VLA9, 21.600, and VLB3, 11.770, replace VLA4 and VLC 11; at 10 a.m., VLB2, 9.680, has been added to 11 a.m., VLG9, 11.900, to 10:45 a.m., replacing VLG, with VLA8, 11.760, to 10:30 a.m., replacing VLA3; and VLC6, 9.615, being still parallel as before. Both the 2:30 a.m. (VLG10) and 6 p.m. (VLA6) transmissions to Japan have been discontinued. (Other

GAY-TONE Phonographs by ALSAM

Model T-22—Table Top Electric Phonograph



Model P-1012-3 tube portable electric phonograph

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Model B-101-hand wound battery operated phonograph



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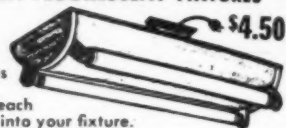
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- Plugs right into your fixture. Underwriters approved parts



VM MIXER RECORD CHANGER \$15.95

- Acatic L-70A. Shure Glider.
- Curved Arm. **\$2.15**
- Crystal Pickups **10 at \$1.95**

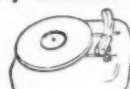
PHONO AMPLIFIER

- 3 Tube AC-DC Completely Wired
- Volume and tone cts. **\$3.50**
- 10 at \$3.25
- Phono. Amp. Kit with 5" Spk. & tubes **\$7.95**
- Less tubes or spk. **\$5.95**
- Uses 12SQ7 50L6 35Z5

- 100 Insulated Resistors **\$1.95**
- 15 Asst. BY-PASS Cond. **.89**
- 25 Asst. Mica Cond. Color Coded **.89**
- Microphone PLUGS with lock nuts PL-55 **.15**
- Ozen circuit Phone jacks **.12**
- EBY Binding Posts **.09**
- BALLENTINE motors and T.T. **3.95**

RISCO RECORD PLAYER

- Easily attaches to any radio. Heavy duty motor. Walnut finish. High output. **\$9.95**



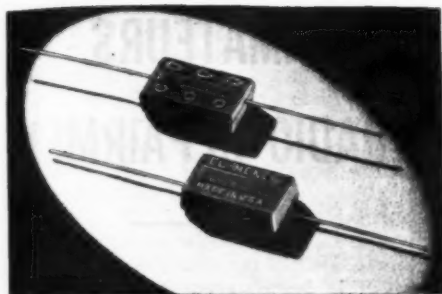
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- Same as above with VM changer **33.00**
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RADIO NEWS



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late tips on transmissions from Radio Australia will be given in "Last Minute Tips.")

Belgian Congo—The 11.720 and 6.295 transmission of *Radio Congo Belge* now opens at 5:15 a.m. instead of at 5:30 a.m., according to official sources. Sign-off is still at 7:30 a.m. French news bulletins are broadcast at 12 midnight, 1, 5:30, 6:30, 11, and 11:45 a.m., and at 1:45 and 3:30 p.m.; Flemish news at 12:15, 1:15, 5:45, 6:45, 11:30 a.m., and at 12:30 and 3 p.m.; and Portuguese at 10:45 a.m.; 6.295 and 9.380 are used at all times except the 5:15 a.m. transmission.

OTC5, 17.770, is heard in England, beamed to Holland, at 1:30 p.m., with good signal strength; no English heard. (Harrison)

Since OTC2, 9.745 (varying) no longer relays the BBC evenings, this station is now heard, 7:15-8:15 p.m. only; opens with English news and usually has repeat around 8:10 p.m. The 17.770 frequency is heard with English news at 8:30 and 11:30 a.m. (Ferguson)

Brazil—PRI3, 6.000, Belo Horizonte, official schedule is 5-9 a.m., 1-6 p.m.; uses 1 kw. at present; hopes to increase power to 5 kw. soon and to include English programs beamed to the U. S. PRE9, 15.165, Fortaleza, is heard Thursdays signing off at 8:30 p.m. with good signal.

British Guiana—It is interesting to note that ZFY, 6.000, Georgetown, is being heard in New Zealand at 5:45 a.m. sign-on; has English news at 6 a.m. (Milne)

Bulgaria—Radio Sofia's second short-wave transmitter, 7.670, is reported heard in Sweden daily, 2-3:40 p.m., paralleling 9.330; English news is scheduled for 3:30-3:40 p.m.

Burma—Radio Rangoon, which has replaced 11.845 with 9.545 for the morning transmission, now opens earlier and again has English news at

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8:45 a.m.; opening is at 8:40 a.m. (Dilg) Sign-off is still at 10:15 a.m.

Cameroun—From Le Chef du Service Radioelectrique du Cameroun, Douala, comes word that transmissions have been suspended. "In the event of their resumption, I will inform you," he added.

CKRX, 11.72, Winnipeg, Manitoba, is being heard well in the East after 5:30 p.m. (Bromley) This station has an *English* news period at 10 p.m.

Ceylon—Since *Radio SEAC*, G.P.O., Colombo, Ceylon, has replaced 11.770 at 7:30 p.m. sign-on with 15.120, it can now be heard with good level at nearly all hours; runs straight through on this 100-kw. transmitter to 12 noon sign-off; the 7½-kw. transmitter on 6.075 is in parallel most of the broadcast period. *Radio SEAC* has introduced a Sunday transmission to Great Britain, consisting of recordings dedicated by SEAC servicemen to their relatives and friends in Britain; this is also heard on 15.120, 12:30-2:30 p.m.; reception is surprisingly good for that hour.

China—A Chinese station on 9.555, with announced call believed to be XOPD, is heard daily, 5:30-7 a.m., and 8:15-8:30 a.m.; call letters are repeated several times; this would identify it as Hangchow, which has not been reported on its assigned frequency of 7.400. Band music played at 8:15 a.m. sign-on sounds like "Columbia, the Gem of the Ocean." Hangchow has been heard mentioned. There is weak interference from Singapore on 9.558. The second transmission is all talk in Chinese by a woman. (Dilg)

A station on 9.57 (not KWID) is being heard in Asiatic language in the East around 6:30 a.m., may be Hongkong. (Bromley)

Curacao—PJC1, 7.250, Willemstad, "*Radio Princess Juliana*," is heard well in the East evenings to 9:30 p.m. sign-off.

Czechoslovakia—Prague, which returned its North American transmission at 7-7:30 p.m. to 15.230 some time ago, is heard with excellent signals here in the East. OLR4A, 11.840, has a new transmission, 5:30-6 p.m., with usual French horn at sign-on.

Ecuador—HC2AN, 7.350, formerly HC2DC (apparently the medium-wave call has been adopted for short-wave, too), verified by letter to Art Cushen, New Zealand, from Casilla 171, Guayaquil.

Egypt—SUX, 16.373, Cairo, calls the BBC early mornings. (Jones, Pa.)

England—Although printed schedules may still list Leopoldville as carrying a part of the North American Service of the BBC nightly, monitors report that Leopoldville no longer relays the BBC, but closes down at 8:15 p.m.

Finland—The evening North American program on 15.190, Lahti, is heard better now; 9.505 in parallel, remains weak; the period lasts, 7:22-7:47 p.m., with the *English* press review at 7:28 p.m.

French Equatorial Africa — *Radio*



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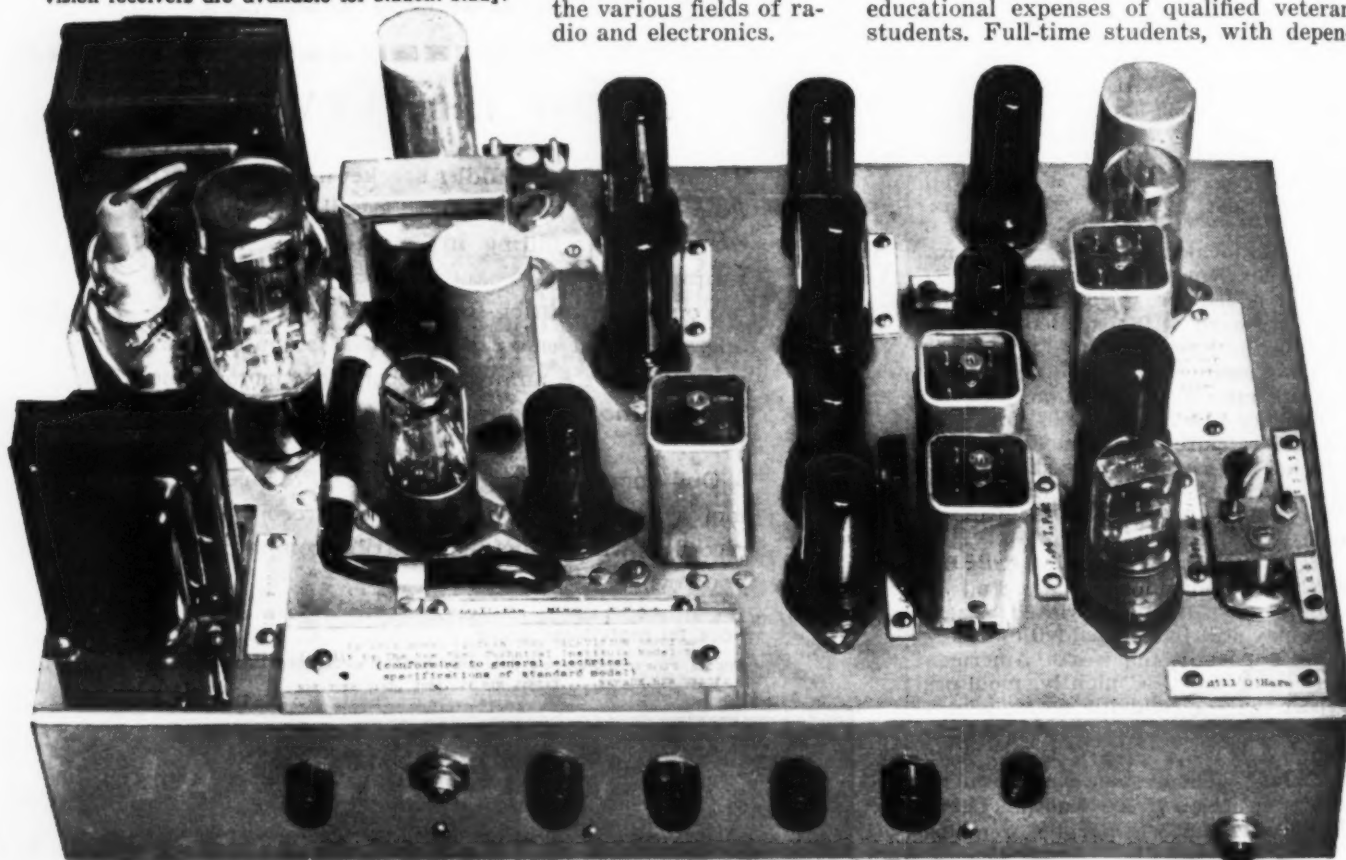
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dents, are also paid a subsistence allowance of \$90 monthly by the VA, and those without dependents, \$65. Many students hold part-time jobs, thus augmenting their monthly subsistence payments. However, you do not have to be a veteran to be accepted as a student.

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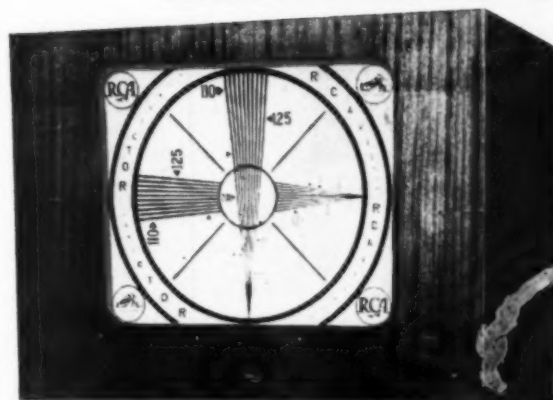
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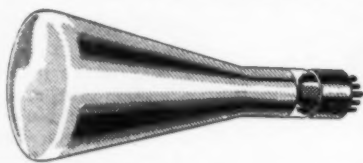
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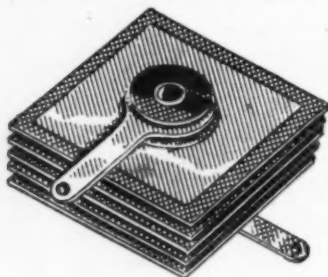
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Brazzaville's 6.024 outlet is heard with fair signals now in the East around 5:30-6 p.m. (in French). (Ferguson)

French Indo-China—Radio Saigon, 11.778, is coming through with good level to the Eastern States, 5-5:30 a.m. (in English). (Jones, Pa.)

Germany—DTSB, 15.105, Munich, is reported heard with music at 8:45 a.m., prior to 9 a.m. contact with New York, point-to-point.

Swedish sources list schedule of Leipzig, 9.730, as 11 p.m.-3:15 a.m. and 5 a.m.-6:30 p.m. An Eastern DXer hears this station opening at 11 p.m. with good level.

Berlin's 6.070 has news in German at 11 p.m. (Saturdays) and signs off at 11:15 p.m. (Norris)

Guatemala—TGWA has returned from 9.685 to its previous 9.760 where reception is good.

Honduras—HEP1, 6.351, San Pedro Sula, is reported at 10 p.m. with American recordings to 10:30 p.m. sign-off. (Norris) Has news in Spanish at 8:30 p.m., no English heard. (Ferguson)

India—Widely reported in the East is the Delhi transmitter on 15.190, heard at 9:30 p.m. with English news. Fair to good signals are also heard in the East at 7:30 a.m. in English news from 9.59 and 9.67, both Delhi, and relayed from Bombay, 9.63 (best).

Delhi's VUD10, 17.830, is heard in English news at 12:30-12:40 or 12:45 a.m., then goes into Hindustani.

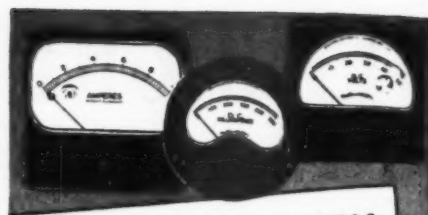
Italy—Radio Italiana, 9.630, is being heard after 6 p.m. in the East, sometimes with Italian amateur hour program, usually with good signal strength.

Japan—The Japanese Home Service, usually good around 5-6 a.m. on 9.505, announces the letters "NHK" at station break; those are not the call letters of the frequency being heard, but stand for "Nippon Hoso Kyokai" or "Japan Broadcasting Corporation." JLR, 6.015, relaying the AFRN, is heard with excellent strength some mornings here in the East around 5-6 a.m.

Call letter changes are being made; recent ones reported include 7.258, JLW; 9.505, JLW2; 11.705, JLW3; 7.552, JLW5; and 15.140, JLW6.

Both 9.560 and 9.505 are in parallel with JLW, 7.258, mornings; sign-off is usually at 8:30 a.m.; some mornings JLW runs until after 9:15 a.m. with a station on 6.095 in parallel. (Dilg) The Japanese Home Service has an English lesson daily at 4:45-5:00 a.m.

Java—It's difficult to keep up on the Java stations these days; frequencies used and times on the air vary from day to day. A new Dutch transmitter is reported heard on approximately 8.000, paralleling Radio Bandoeng, 10.060; apparently, it replaces 18.135, now used for telephony; signal is good on West Coast. Radio Bandoeng appears to have extended its schedule to 10:50 a.m. with Dutch entertainment, once appeared to be a PCJ (Hilversum, Holland) relay for the Forces; one Saturday, 8.000 and 10.060 were heard past 11:35 a.m. with Dutch entertainment. (This may be PMD,



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According to New Zealand sources, the Free Indonesia stations should be addressed, "Radio Republic Indonesia," c/o Indonesian Broadcasting Centre, Poest RRI, Soerakarta, Java.

Korea—JEW, 9.295, Seoul, 10 kw., is telephone station for official U.S. Army use; works JSO, 10.340, 6 p.m.-4 a.m. daily. (Miller, Japan)

Madagascar—Radio Tananarive has added a third transmitter, 10.615, to all its transmissions, which are given at 11 p.m.-12:15 a.m., except Sunday; at 3:30-5 a.m. and 10-11 a.m. (Sunday from 9 a.m.).

Malaya—The new Singapore 19-meter transmitters are now heard on their announced frequencies of 15.275 and 15.300; usually are audible after 5 a.m., sometimes good around 8:30 to 9:30 a.m. sign-off. Last English news period is now at 9 a.m.

According to a recent DX news broadcast from Radio Australia, Singapore's English news periods are now at 3:45, 6:45, 7:30, and 9 a.m.

Mauritius—Port Louis, on a reported frequency of 7.295, is scheduled 3:15-4:30 and 7:45-9:55 a.m. daily, except Sunday, according to the URDXC; is listed as simply 42 meters. Program consists chiefly of music and French news, but news in Hindustani is added on second transmission. Portions of the program, however, are announced in English. A medium-wave transmitter is used on 1333 kcs.

Monaco—Radio Monte Carlo, 6.130, is on the air now with a reported schedule of 1:30-3:30 a.m., 6-8 a.m., and 1-5:15 p.m.; is heard in Stockholm only after 3 p.m.; often has interfer-

ence from the Oslo, Norway, relay station on same frequency. (Skoog) Has news in French at 5 p.m.

Mozambique—CR7BE, 9.710, Lourenco Marques, is heard some nights in the East between 11 p.m.-12 midnight. (Kernan)

New Zealand—According to an announcement recently by Radio Australia, the new short-wave transmitters in this country will be ready for operation in January. ZLT7, 6.715, Wellington, continues to be widely heard in its 4:30 a.m. English news period.

Northern Rhodesia—ZQP, Lusaka, is scheduled to Africa, 10:30 a.m.-12 noon, on 7.220, 7.285, and 3.900; Sundays, 4-5:30 a.m. (Kortvags-Lyssnaren)

Norway—A Swedish correspondent reports that LKJ2, 6.130, is heard in parallel with Oslo-Kloofa, 6.200, at 11:30 a.m.-5 p.m.; he did not state whether this replaces 9.540 or is additional.

Panama—By this time, the new Panama stations which have been testing for some weeks, will likely be on regular schedule. HOXB, 11.810, was put on the air in recent tests, in addition to HOXC, 9.660 (varying), and HOXA, 15.100 (first one reported to me). HOXB has been heard with excellent signals at various times afternoons and evenings, usually at 10-11 p.m. A non-directional antenna has been employed in the tests, but Central and South American beams were to be used when regular schedules are effected. Test announcements of "Radio Central Americana" ("The Voice of Central America" is also used) have been heard in Spanish and English, occasionally in German. Reports

S/Sgt. Dan DiThomas, one of the Army specialists assigned to the United Nations Recording Studios in the basement of Hunter College, New York, explains the operation of the Hart film recorder to Dr. Oscar Lange, Polish Ambassador to the United States and Representative at the United Nations Security Council. All of the deliberations of the Security Council are being recorded for preservation in the Archives of both the United States Government and the United Nations. Logs of the recordings are kept in order that any part of the record may be located by means of a trackage indicator.



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An interesting photo-verification has been received by Eastern DXers, showing several scenes at HOXC, including the station tower, studio building, and transmitter rectification system. The chief engineer, W. T. Morrison, stated he finds humidity a great problem, the heavy moisture working a real hardship to radio transmitting equipment. (VRC) Mr. Morrison is from Pennsylvania, we are informed.

Poland—Although a letter from *Polskie Radio*, Warsaw, states that the Warsaw III transmitter on 6.100 (varying) operates daily at 9:55 a.m. to 8 p.m., and on 9.530 only for one hour, 5-6 a.m., a report from England indicates that 9.530 is heard there at 4 a.m. identifying as Poznan.

Siam—*Radio Bangkok*, 5.990, is heard at 9 a.m. on the West Coast; sign-off is at 9:30 a.m.; no English has been heard by the reporter. (Gould)

South Africa—A station on 6.170, believed to be Durban, is heard with carrier around 12:08 a.m. and with piano-like chimes at 12:18 a.m. opens with march at 12:20 a.m., announcing in what appears to be Afrikaans; has usual setting-up exercises, talks, and music; no English heard. Extremely strong signals. (Ferguson)

Spanish Morocco—*Radio Tetuan*, 6.067, is heard, 2:30-3 a.m. (URDXC)

Sweden—SBT, 15.155, Stockholm, is coming through nicely again in the North American period, 10-10:55 a.m. daily.

SDB2, 11.780, was heard recent'ly at 4:15-5 p.m., clear, steady. (Kernan)

Switzerland — Ironically, perhaps, now that summer is ended, Bern has finally moved to summer frequencies for North America. At 2:20-12:55 p.m., HEI7, 15.320, replaced HED4, 10.405; HEI7 has some interference from Canada's CKCS on the same frequency;

Four captains of the Atlantic Refining Co. fleet examine the indicator of Raytheon's Mariners Pathfinder radar test installation aboard the SS Atlantic Mariner. Test runs, using radar, have been made on regular routes and skippers report good results.



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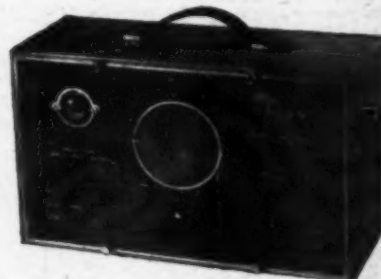


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at night, 8:30-10 p.m., HER5, 11.865,
replaced HER3, 6.165, with HE14,
9.539, still in parallel; good signal
from both, but HER5 has some splat-
ter from GSE, London, on 11.860.
HER5 also replaced HE15, 11.715, at
3:50-4:25 p.m. to Africa; and HEK4,
11.960, at 4:45-5:15 p.m. to South
America. I recently heard HER5 in
English on a Monday morning between
12 midnight-12:30 a.m., probably runs
later, excellent signal.

Tahiti—According to Art Cushen,
New Zealand, FO8AA, 6.980, the *Radio
Clube of Oceania*, at Papeete, now
transmits at 10 p.m.-12 midnight every
Tuesday and Friday, usually with re-
cordings until 10:30 p.m., news and
talks to 11:30 p.m. (in French), and
with a Tahitian program to sign-off.
(Inquiries by me mailed direct to
FO8AA are still being returned; does
anyone have the correct address?)

Turkey—Some Eastern DXers re-
port they are able to pull TAP, 9.465,
Ankara, out of the "hash" on Sunday
afternoons, 4:30-4:45 p.m., when the
Postbag program is given. Too much
CWQRM for your short-wave editor!
Reception from this quarter should be
improving greatly now and TAP may
come in well here in the East during
the winter, such being the case last
year.

U.S.S.R.—The Spanish Freedom Sta-
tion, "Espana Independiente," is heard
daily on four frequencies, approxi-
mately 13.640, 15.380, 15.480, and
17.270 (all vary from day to day and
sometimes from hour to hour). Broad-
casts are heard for 22 minutes dura-
tion each, beginning hourly on the
half-hour from 9:30 a.m. through 5:30
p.m.; jamming is reported. Spanish
is used exclusively, and the transmis-
sion ends with the phrase: "Viva
Espana, Arriba Democracia!"

U.S.A.—According to a letter re-
ceived by an American listener from
Comdr. R. D. Thompson, U.S. R, on
the Appalachian, NCLG's transmitters
during the recent Atom Bomb Tests
were rated at 600 watts; NXHC (Pan-
amint) and NICO (Mt. McKinley)
each 350 watts; NIGF (Spindle-Eye)
7500 watts; and NCKN (B-29) 40
watts. The B-29 used 2 mcs. for relays
to the ships at Bikini Atoll. Higher
power was not used on the ships be-
cause of space and interference lim-
itations imposed by radioteletype and
radio-photo equipment crowded on the
ships; hence, the necessity of relays
at Guam (KU5Q) and Oahu (WTJ,
NPM) in order to provide good recep-
tion at San Francisco over the long
hours communication was desired.
Direct contacts were tried by the ships
during daytime on all frequencies
from 13 to 24 mcs., but usable signals
were not obtained. Night contacts
were reported as excellent.

Veries received on 10.640 show ship
going down in water, Marshall Is-
lands, Operation Crossroads, Bikini
Atoll, and U.S.S. Appalachian—all
printed prominently. (URDXC)

Vatican—The 15.095 and 9.660 fre-
quencies are reported by Swedish lis-

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1008	50	600 Volt Paper Condensers	2.28
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Christmas

This Christmas season of good-will we greet our many friends in the radio and electronic industries and to extend to all of them our best wishes for a Merry Christmas and a Happy New Year. A year has passed since the formation of the Electronic Distributor and Industrial Sales Department, a year during which we have developed into a smoothly functioning organization known from coast to coast for the quality of our three great lines, Thordarson, Meissner and Radiart. We are proud of this success and we are grateful to those in the industry who have helped to make it possible.

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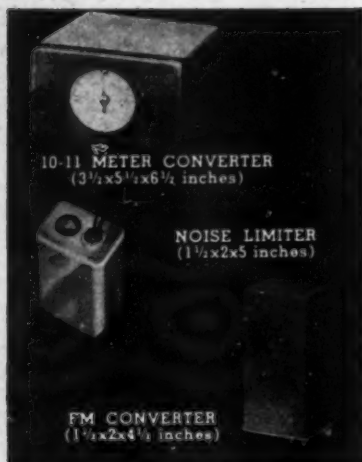
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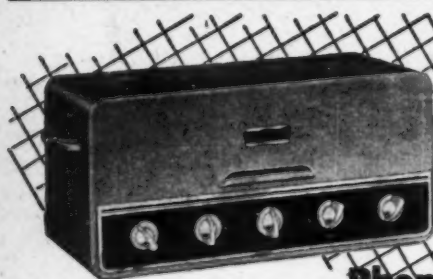
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Newcomb announces a NEW MODEL 30-Watt phonograph amplifier, the KXP-30... Its truly remarkable performance, its unusual flexibility of application make the KXP-30 the perfect answer to the amplifier needs of the most critical... For wired music reproduction; as a monitoring or playback amplifier for broadcast or recording studio, the KXP-30 is unequalled... In the home, as a deluxe phonograph amplifier, its full quality treble and bass tones at even lowest volume levels make this outstanding contri-

bution by Newcomb the newest answer to the postwar demand for quality in the sound reproduction field... Freedom from hum; dual-acting, distortion free individual tone controls; extended flat frequency response from 20 to 20,000 cycles... these and many other features combine to make the KXP-30, as all Newcomb products, the logical choice of the quality-minded buyer... Not Merely as Good as the Others, but Better than All Others!
Send for details of our complete line of sound equipment.

THE SOUND OF QUALITY

Newcomb

AUDIO PRODUCTS CO.

MANUFACTURERS

DEPT. F 2815 S. HILL STREET, LOS ANGELES 7, CALIFORNIA

teners to have *English* at 10 a.m.; the 5.968 and 6.190 frequencies have French at 2 p.m., Italian at 2:30 p.m., Spanish at 3 p.m.

Yugoslavia—*Radio Belgrade*, 6.150, has *English* news at 3:30 p.m. Schedule appears to be 3-5 p.m. (Skoog)

Last Minute Tips

So many inquiries have been received concerning whether or not Moscow will verify that we are furnishing an address, given by the Russian Embassy in Washington to Eastern DXers as a "possibility." The Embassy "does not know" whether or not Moscow will verify. A registered letter report sent by a Pennsylvania DXer to the address indicated below has brought a signed return receipt—but at last report verification had not yet arrived. (*If anyone is able to verify Moscow, please let me know!*) Address given by the Embassy is: U.S.S.R. Society for Cultural Relations With Foreign Countries, Bolshaya Gruzinskaya 17, Moscow, U.S.S.R.

According to the "Newark News Radio Club," the Baltimore and Ohio Railroad uses a frequency of 15.6525 for test equipment—changing hand, typewritten sheets, photos, or blueprints into radio impulses; these are received exactly as transmitted.

Radio Brazzaville concludes its broadcasts on 9.984, 11.970, and 9.440 now at about 8:20 p.m.; the 11.970 station returns to the air at 12 midnight with the "first" transmission of the day.

The Japanese Home Service transmitter on 9.505 (which so many listeners report announcing as "NHK," which stands for Japan Broadcasting Corporation) has a course in *English*

CLEAN RADIO DIAL COVER

The glass or composition transparent cover over the radio dial becomes coated with a scum or layer of dust that in time obscures the dial numbers or makes such numbers hard to read.

This coating may be easily removed by applying carbon tetrachloride to both sides of the cover. Note illustration..... H.L.



Why immediate deliveries mean more friends for Simplon Radio Products

The experience of users of Simplon Radio products proves that these fine instruments deliver more of the "luxury-set" quality that people want—at popular prices.

So it's good news that we're now able to make immediate delivery on both the already-popular table model radio and the new Simplon radio-phonograph combination. It means that more users—more dealers—can now enjoy the benefits from "Radio Enjoyment at its Best."

Model WVV2—5-tube, AC-DC Radio—the radio that established the Simplon reputation for quality. \$32.10 Federal Tax included.

If you're already among the holders of the Simplon Radio Franchise, you'll do well to re-order in anticipation of our expanding advertising program. If you do not now hold a Simplon Franchise, write or wire today for full details on the availability of a Simplon Radio Franchise for your territory.

**Two leaders
in the
line**

SIMPLON
Reg. U. S. Pat. Off.

These two fine instruments enable you to offer "luxury-set" quality in the popular price range. Additional models soon available.

Model WVV2
5-tube, AC-DC Radio—the radio that established the Simplon reputation for quality. \$32.10 Federal Tax included.

Model CA3
Radio-Phonograph Combination 5-tube AC-DC Radio. Automatic record changer. Crystal pick-up. Plays 10 12" records or 12 10" records. \$80.65 Federal Tax included.

Write or phone today for full details on special quality features and prices.

SIMPLON RADIO

Manufactured by Industrial Electronic Corporation, 505 Court Street, Brooklyn 31, N. Y.
December, 1946



Radio Servicemen

FREE CATALOG

Your Buyer's
Guide for New
Test Instruments

Contains nationally-known volt-ohm milliammeters, tube testers, signal generators, set analyzers, oscilloscopes, etc., all available on Wards Convenient Monthly Payment Plan. This first post-war issue of the Airline Electronic Equipment Catalog also features Amateur communications receivers and Wards Airline Sound Systems. Send for your free copy today.

Mail this coupon to
MONTGOMERY WARD, Chicago, Ill. •
Please send your free Catalog of Airline
Electronic Equipment.

Name _____
(Please PRINT Plainly)

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daily, except Saturday and Sunday, 4:45-5 a.m. (Hart, NNRC)

Late tips from the URDXC give JZC, 3.075, Tokyo, 10 kw. power, scheduled, 4-9 a.m.; Bandoeng, Java, 2.970, new, to sign-off at 10 a.m.; latest reported frequency of Radio Vienna is 9.875, is heard afternoons in England through bad QRM, announcing as Radio Linz.

The Happy Station Programs of PCJ, 9.590, Hilversum, Holland, are coming through nicely now in Kansas, 10-11:30 p.m. (Seckler)

Baden-Baden, 6.320, Germany, is weak at 11:30 p.m. beginning. (Beck)

Moscow's Latin American Service is now heard 7:30-10 p.m. over 15.41, 11.89, 9.71 and Leningrad, 11.63. Radio Kiev, 6.020, signs off at 6 p.m., and returns at 6:20 p.m. on 11.72 to the U.S.

Radio Belgrade, 9.420, begins at 12 midnight with chimes; a woman then reads the news in Serbian; has strong signal but fades rapidly around 12:45-1 a.m. (Beck)

An Indonesian station is being heard on 12.000 daily, 4-4:30 a.m. in English; English news irregularly at 4:15 a.m. This station appears to be part of the Indonesian Broadcasting Service, apparently is Dutch-controlled as the program continues at 5 a.m. in Dutch; sign-off is at 6 a.m. (Don Miller, Louisiana)

Radio Saigon, 11.778, is heard on West Coast to sign-off at 9:45 a.m. with "La Marseillaise"; reception good with occasional fading. (Gould)

Some mornings, the Indonesian on 11.000 comes in well here in the East around 6:30 a.m. when English news has been heard on occasion; announces, "This is the Indonesian Broadcasting Station," and "This Is the Voice of Free Indonesia"; frequency appears to be that of prewar PLP. Usually fades out here in West Virginia around 7:30 a.m.

Radio Makassar, 9.358, Celebes, usually has a good signal here in the East around 6:30 a.m.; Dutch is the chief language, but does use English at irregular times.

Via airmail from Ente Italiano Audizioni Radiofoniche, Torino, Italy, comes this information: "A musical orchestral performance of 'Canzone del Pieavo' (Song of the Piave) by E. A. Mario, followed by the slogan, 'Qui la Radio Italiana,' marks the starting of our broadcasts, and the same song their end. Our short-wave stations are Busto Arsizio I and II (Varese), respectively, on 9.630 (50 kw.) and 11.810 (10 kw.); and Rome, 6.030 (1 kw.). Please note that all inquiries must be addressed to Rai-Radio Italiana, Via Arsenale 21, Torino, Italy. Italian is the language used during our various broadcasting periods but announcements in foreign languages are given when it is requested by special broadcasts. Schedule, Busto Arsizio I, 12 midnight-1:15 a.m., 5:55-7 a.m., 1-5:45 p.m.; Busto Arsizio II, 1-5 p.m.; Rome, 12 midnight-1:35 a.m., 4-8:10 a.m., and 10 a.m.-5 p.m. There are no newscasts in

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MODEL M II



All instruments shipped complete with batteries, test leads and instructions for use. Net Price

26.95

PROMPT
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FEATURING:

... A large $4\frac{1}{2}$ " 400 microampere meter for accurate readings on all ranges.
27 separate ranges for measurements.
1000 ohm per volt sensitivity AC or DC.
... A metal crackle finish cabinet for rugged use under all working conditions.

DESIGN DATA

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0 to 10/50/250/500/1000 Volts
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0 to 10/50/250/1000 Volts
- 5 Output Meter Ranges
0 to 10/50/250/500/1000 Volts
- 4 DC Current Ranges
0 to 1/10/100/1000 MA
- 3 Resistance Ranges
0 to 5,000/500,000 ohms
0 to 5 Megohms
- 5 Decibel Ranges
-10 to +14, +4 to +28, +18 to +42,
+24 to +48, +30 to +54 DB

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WORLD-RANGING
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5 WAVE BANDS
SEPARATE CHASSIS or
COMPLETE CONSOLES AVAILABLE
30 DAYS TRIAL



The SYMPHONY GRAND AM - FM RADIO-PHONOGRAPH CONSOLE

A magnificent radio and musical instrument that is completely new—from the ground up. Big, powerful Series 16 Chassis brings in long wave, short wave and FM reception... an automatic record-changing phonograph... and scores of NEW Post-war features. EASY TERMS

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NEW!

WESTON Mutual Conductance Tubechecker and Circuit Analyzer



MODEL 798—TYPE 3

*Outstanding
Features*

✓ Direct-reading mutual conductance tests, and "Good-Bad" indications.

✓ New patented high frequency tube testing circuit.

✓ AC-DC volt-ohm-milliamperage ranges.

✓ Tests 4, 5, 6, 7 prong octal, loctal, miniature, and acorn tubes... spare octal and miniature sockets.

✓ Hot neon leakage test between any two tube elements... neon short check,

✓ Adjustable plate, screen, grid bias, and signal voltages.

✓ Flexibility in switching simplifies testing present and future tubes.

✓ Durable heavy-gauge, light-weight aluminum case.

Model 798 combines broad utility, ruggedness, and dependable accuracy for maintenance of sound and electronic equipment. Detailed bulletin available. Weston Electrical Instrument Corporation, 658 Frelinghuysen Avenue, Newark 5, New Jersey.

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NEW ORLEANS • NEW YORK • PHILADELPHIA • PHOENIX • PITTSBURGH • ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS • SYRACUSE • IN CANADA, NORTHERN ELECTRIC CO., LTD., POWERLITE DEVICES, LTD.

December, 1946

AT LAST!!

A Really Practical Book on Servicing Television Sets

Written in plain English, this complete, up-to-the-minute handbook has the practical information you need to service television equipment. It shows you, step by step, exactly how to repair and adjust the television receiver. Hundreds of clear illustrations and diagrams bring every element, every circuit, right before your eyes and make their functions and operations easy to understand. You'll be amazed at how simple television can become with



TELEVISION SIMPLIFIED

by MILTON S. KIVER
Associate Instructor in Radio, U.S.
Army Air Forces. Formerly Instructor
in Radio, Illinois Institute of Tech-
nology.

This brand-new, authoritative book not only contains specific instructions for trouble shooting and the repair and maintenance of actual sets, it also gives you a complete factual picture of present-day television, and brings the tremendous opportunities of this great new industry within your reach. Beginning with a clear, overall picture of the entire field, it breaks down the television receiver into its component parts and circuits. It analyzes them, step by step, showing how they are formed, the roles they play, and their operating characteristics.

BRIEF OUTLINE OF CONTENTS

The Television Field; Ultra-high Frequency Waves and the Television Antenna; Wide-band Tuning Circuits, Radio-frequency Amplifiers; The High-frequency Oscillator, Mixer and Intermediate-frequency Amplifiers; Diode Detectors and Automatic Volume-control Circuits; Video Amplifiers; Direct-current Reinsertion; Cathode-ray Tubes; Synchronizing Circuit Fundamentals; Deflecting Systems; Typical Television Receiver—Analysis and Alignment; Color Television; Frequency Modulation; Servicing Television Receivers; Glossary of Television Terms.

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Let this great book prepare you to take advantage of the brilliant opportunities television offers. Send for it NOW!

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Please send me "Television Simplified." Within 10 days I will either return the book or send you \$4.75, plus a few cents postage. (If you enclose check or money order for \$4.75 with this coupon we will pay the postage. Same return privilege, and refund is guaranteed.)

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R.N.—Dec. 46

English at present. Nor do we send any verification. Programs for ex-internees and war prisoners are scheduled on 9.630 for Monday, 9-10 a.m., to Germany; Tuesday, 10:30 a.m.-12:30 p.m., Russia (Western Europe); Thursday, 7-8 a.m., North Africa, and 12 noon-1 p.m., South Africa; Friday, 10-11 a.m., India and other Asiatic countries; and Saturdays, 2-4 a.m., Australia and Oceania and without indication of location. Other fixed items include for 2 p.m., a symphony
(Continued on page 145)

1947 ELECTRONIC EQUIPMENT SHOW

THE week of May 11th has been set by the directors of Radio Parts and Electronics Equipment Shows, Inc. as the date of the 1947 RPEE Show to be held in Chicago.

Sponsored by the National Electronic Distributors Association (NEDA); Association of Electronic Parts and Equipment Manufacturers; Sales Managers Club Eastern Division; and Radio Manufacturers Association (RMA), the show will feature a four-day session instead of the customary three days. The Exhibition Hall will be open from May 13 to 16 inclusive. A special event to be designated the "NEDA Day" with a program planned and executed by the distributors' association is to be another new feature of the show.

"Open House Day," during which time radio servicemen, amateurs, engineers, and the general public will be admitted, is another innovation which will be welcomed by those unable to attend previous exhibits.

Ken Prince, show manager, has also advised that advance registrants will receive their badges by mail to eliminate the necessity of their waiting in lines at the show.

The tentative program for the show includes: Sunday, May 11th, Organization meetings and sales meetings; Monday, May 12th, Organization meetings and sales meetings; Luncheon meeting of member exhibitors of RPEE Shows, Inc.; Keynote dinner for entire industry; Tuesday, May 13th, Exhibition Hall opens, hours 10:00 AM to 6:00 PM. Attendance at Exhibition Hall to be confined to members of sponsoring manufacturers, their booth attendants, their sales representatives and distributors; Wednesday, May 14th, Same as Tuesday; Thursday, May 15th, NEDA Day, featuring an elaborate program of events. Exhibition Hall open during same hours as above; Friday, May 16th, Open House Day, at which time radio servicemen, amateurs, engineers and the general public will be admitted without registration.

Arrangements for hotel rooms and housing will be similar to those of 1946. A priority system has been established to give exhibitors first preference in rooms at the Stevens Hotel. The Congress Hotel will be headquarters for manufacturer representatives, who have been allotted 400 rooms.

Reservations for space in the Exhibition Hall closed on November 25th and drawings for space assignment will be held Wednesday, December 4th, at the Hotel New Yorker, New York City.

Radio News has already expressed its willingness to again print a daily paper as a service to the Show.

FREEDOM FROM BREAKDOWN



ROWE NO. 7 PERMANENT MAGNETIC DRIVER UNIT

A long lasting unit that provides extra power with a minimum of breakdowns and replacements. Overcomes the many annoyances that long have been troublesome to sound engineers.

The 3 lb. 4 oz. ALNICO heavy duty magnet . . . the one-piece metal diaphragm with voice-coil mounted thereon . . . the heavy gauge steel and brass parts are just a few of the refinements in design and construction. Write for circular RN-1246 which gives complete details.

ELECTRONICS DIVISION

ROWE Industries
3120 MONROE ST., TOLEDO 6, OHIO

BARGAINS



Cat. No. AIRCRAFT RADIO BEAM FILTER
X-315 Can be used with aircraft radio receivers to filter radio marker beam, or to receive voice signals from marker beam transmitter stations or both. \$4.50
Attention: AIRCRAFT TRANSMITTER MFGS.
Write for quantity price on above.

METERS

W-106 G.E. 3 1/2" 0-1.0 amp. D.C. \$1.25
W-107 G.E. 2 1/2" R.P. Ammeter 0-6 amp. R.F. \$1.25
with internal thermo-couple. \$1.25
W-108 Triplett 2 1/2" portable test milliammeter— \$4.50
35ma D.C. with 3" rubber wire, plug.

TRANSFORMERS

A-102 Raytheon Power Trans. 115/6cps pri., sec. 1. 940V/CT 110ma, sec. 2. 530V/CT/20ma, sec. 3. 5V/2a, sec. 4. 5V/3a, sec. 5. 6.3V/1a, sec. 6. 6.3V/0.3a. All sec. insulated for 1780V RMS or higher. Fully cased. \$3.25
A-111 Line matching trans. Variable line impedance. \$1.50
tapped pri. \$1.50
A-130 Trans. Pri. 115-250V. 50-60cps. sec. 335 volt/250ma. 1420V/170ma. 710V/200ma. 355V/20ma. 5500V/2ma. Half case with 15 colored coded wire leads. 7" long, 6 1/2" wide, 5" high. Excellent for large scopes and television. \$18.00

CONDENSERS

C-107 Imfd. 1000 volts oilfilled. Rectangular can. \$2.50
Cornell-Dubilier. 800 or 4 for \$2.50
C-150 Var. air-tuned hi-voltage capacitor 8-3 1/2 mfd. Insulante ins.; suitable for neutralizing and tank \$4.00
C-102 15 mfd./25 volt. Sprague Electrolytic. \$1.12
C-103 Aerovox. .01 mfd./500 volt. Oil filled paper tubular. \$1.12
C-127 Triple 16 mfd./350 volts Electrolytic. \$1.75
Write for quantity price.
F-110 Filter Chokes. Rated 15hy at 150ma. Pair cased. \$1.50
F-115 Filter Chokes. 50hy at 370ma. Hi-voltage insulation and insulators. Fully cased. \$4.75
T-103 Delta T Pads Controlab. 500 ohm carbon. Servo-driver slot shaft. Excellent for Pa. Amplifier and recording work. \$1.75
V-314 Telegraph Keys—Excellent for amateurs \$1.75
C-110 4 mfd. 1500 volt condenser oil-filled Cornell-Dubilier. \$1.75 or 2 for \$2.00

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At least 30% Deposit with all COD orders. Minimum order \$3.00. Many other items of interest. Home of service for HAMs—Experimenters—Radio Repairmen.
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SECONDARY FREQUENCY STANDARD

Model 18A

Measures transmitted and received signals with high accuracy. Multi-vibrator and tuned output amplifier.

- 100 KC to 45,000 KC
- 1000-100-10 KC Check Points
- 100 to 250 V., 25-60 Cycle

Power Supply self contained with dual crystal, spare tubes and instruction book.

A Buy At

29.50

Your Cost Only

59.50



COMPRESSOR AMPLIFIER

A precision unit, extremely useful for PA systems and transmitting applications. Maintains 100% modulation percentages. Doubles the output of the transmitter by raising the average modulation level. Frequency response (30 to 10,000 CPS).

- 38 db. Amplifier Gain • 600 OHM Input and Output • Relay Rack Mounting
- Power Supply: 100-220 Volts, 50/60 CPS, self-contained.

Less tubes **325.00**

Model 150B

250 Watts TRANSMITTER

Conservatively rated phone and CW. Fully automatic—push to talk, etc.

Variable frequency oscillator (ECO) included. Unit comes complete

with self contained 110 volts 60 cps power supplies, mike, key and spare parts—just connect to power source and you are on the air.

Frequency range: 1500 to 12,500 KC (continuous coverage). Short required turns on two coils for 20 meters. Convertible to 10 meters. Pi network matches directly to antenna on 72, 150 or 300 ohm line.

TUBE COMPLEMENT (tubes not furnished): Modulator: 1-6J5, 2-6V6GT's, 2-811's, 2-866A's, 1-5U4G. Shifter: 1-6F6G, 1-6L6G, 1-VR150, 1-VR105, 1-5U4G. RF Final: 1-813, 2-866A's.

For the
portable rig

INVERTER

Input 6 or 12 VDC. Output 110 V.

AC, 60 CPS. Designed for continuous

operation delivering 15 Watts

(low power) or 50 Watts as desired.

Shipped complete with spare vibrator. Entire

unit self contained in steel cabinet. Size 7½ x 8 x 8½.

All transmitters brand new and packed in original manufacturer's export crate. Two instruction books supplied. Built by Meissner to U. S. Signal Corps specifications.

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To Go On The
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349.50

DYNAMOTOR

Designed for 6 or 12 Volts

DC Input. Delivers 500 VDC

@ 160 MA continuous service.

With intermittent operation the

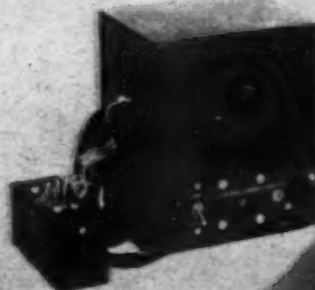
unit will deliver 224 MA. Furnish

ed complete with integral filter cir

cuit, relay, fuses, etc. Type P103A.

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lines



with POWERSTAT VARIABLE TRANSFORMER Type 116...

a small light-weight yet extremely rugged instrument that delivers any voltage from 0 to 135 volts at the turn of a knob. When plugged into a 115 volt single phase outlet, loads up to 1000 watts can be accurately controlled. It is ideal for checking — intermittent oscillators by lowering the operating voltage — defective parts (capacitors etc.) by raising the voltage. POWERSTAT type 116 is an asset to any service bench.

Fill out the coupon, checking the method of payment desired, place in an addressed envelope and a POWERSTAT type 116 will be shipped immediately from stock... or see your nearest distributor.

YOUR PRICE... only \$18.00
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☐ Please ship POWERSTAT TYPE 116 for which
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in the amount of \$18.00 is enclosed

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128

Within the INDUSTRY

L. E. BESSEMER, formerly chief production engineer of the Manufacturing Division of the *Collins Radio Company*, has been promoted to general manager of that division.

Mr. Bessemer joined the *Collins* organization in 1935, after receiving his Bachelor of Science in Electrical Engineering from Georgia Tech. His first job at *Collins* was as wireman on a production line. He later became line foreman, then design engineer and in 1942 he organized the production control department.



GEORGE F. KNOWLES has joined the design firm of *Spectrum Engineers, Inc.*, Philadelphia, Pa., as consulting mechanical engineer. Mr. Knowles, who received his technical training in England, was production manager for *Fox Industries, Inc.*, during the war where he directed the design and production of radar scanners and precision aircraft instruments.

REX L. MUNGER resigned recently as sales manager of *Taylor Tubes, Inc.*, Chicago, Ill. A new sales manager has not as yet been appointed.

DICK MORRIS is the newly appointed general sales manager for the *Snyder Manufacturing Company* of Philadelphia.

Mr. Morris, who has been with the *Snyder* company for more than eight years, will direct future plans to open *Snyder* warehouses and offices in Los Angeles, Chicago and Canada. He will also supervise the expansion of the current lines, which include auto radio antennas, microphone stands and other equipment.

WORNER ELECTRONIC DEVICES of Chicago, makers of industrial electronic equipment and intercommunication systems, moved into their own new large plant at Rankin, Illinois, November 1st.

G. E. (ED) DE NIKE has joined the *Morris F. Taylor Company*, manufacturers' representatives, as vice president.

Mr. DeNike has been active in the radio industry since 1929 when he joined the *National Union Radio Corporation* as assistant advertising manager. He spent sixteen years with *National Union* serving successively as advertising and sales promotion manager, district sales manager, director

of public relations and sales manager of the distributor division.

In 1945 Mr. DeNike joined the *Zig-Davis Publishing Company*, Chicago, in an executive editorial capacity.

He will make his headquarters in Silver Springs, Maryland from which office he will serve the southern New Jersey to Gulf of Mexico area.

BARKER & WILLIAMSON, manufacturers of air inductors, heavy duty variable capacitors, and various instrument specialties, have announced the leasing of a new factory building comprising 93,000 square feet in Bristol, Pa. This will be devoted exclusively to special and developmental work and will be operated as a separate unit from the company's main plant in Upper Darby, Pa.

SONORA RADIO & TELEVISION CORP. has taken over the plant, machinery, equipment and business of *Sterling Wood Manufacturing Co.* in order to insure the continuance of the flow of radio cabinets to *Sonora*.

Sterling is currently producing 30,000 radio cabinets a month, with an expansion program underway to increase the cabinet production to 40,000 a month.

BRUCE CUMMING has been appointed Chicago area district manager for *Solar Capacitor Sales Corp.* Mr. Cumming will have active charge of sales of *Solar* capacitors and other products to electrical and radio distributors in Chicago and vicinity.

SAM CASCIO, administrator of veteran affairs for the *Hallicrafters Company*, producers of high frequency radio equipment, has been promoted to personnel director of that company.

Mr. Cascio joined *Hallicrafters* in 1936. A veteran of four years Army service, he returned to the company in September, 1945 as a technician in the test equipment department.

In his new position, Mr. Cascio will have charge of all industrial relations and personnel functions in addition to his present position as veteran affairs administrator.

MARION ELECTRICAL INSTRUMENT COMPANY of Manchester, N. H., is offering a special consulting service in connection with their new Benchtype Induction Soldering Unit, a special induction heater for production soldering



RADIO NEWS

of small metal parts and assemblies.

Any manufacturer interested in the possible application of this soldering unit to reduce the cost of his production, may forward sample parts of his products which he thinks might lend themselves to such soldering. Marion engineers will determine whether or not the part can be soldered by the heater and a complete report will be submitted to the manufacturer.

ALLAN G. WILLIAMS was recently appointed regional manager for the New England area of *Galvin Mfg. Corporation*, manufacturers of Motorola home and car radios and Motorola gasoline car heaters.



Mr. Williams joined the sales department of the *Galvin* organization in 1935. In 1942 he joined the U. S. Army. After two and a half years of foreign service with the Army Air Forces, Mr. Williams was honorably discharged in November 1945 and returned to *Galvin*.

His headquarters are at 376 Lexington Ave., Auburndale, Massachusetts.

CLAROSTAT MANUFACTURING CO., INC., of Brooklyn, N. Y. has acquired the entire outstanding stock of *Kurman Electronics Corporation* with offices, research laboratory and plant in Long Island City, N. Y.

Kurman Electronics, manufacturers of a complete line of relays, electric timing motors, and self-starting clocks for household and other uses, will operate as a wholly-owned subsidiary of *Clarostat*, with its own engineering and production personnel and plant.

The new officers of *Kurman Electronics* are: Victor Mucher, president; George Mucher, executive vice president; Nathan Kurman, vice president in charge of research; William Mucher, treasurer; and Charles H. Burnell, secretary.

ELECTRO-VOICE, INC., manufacturers of a complete line of microphones, announced recently that they have combined all the facilities of their former South Bend Plants No. 1, 2, and 3 into one big modern plant in Buchanan, Michigan, 14 miles north of South Bend. This move makes possible further expansion of *E-V* research, engineering and productive capacities.

AIREON MANUFACTURING CORP. has announced the appointment of Kenneth D. Halleck as a vice president and Bernard D. Craig as a vice president and director. Mr. Halleck has been a director of the company for some time.

Mr. Halleck, who joined *Aireon* in 1943, has been assistant general manager of the company in charge of the general administration of production, sales and other executive management



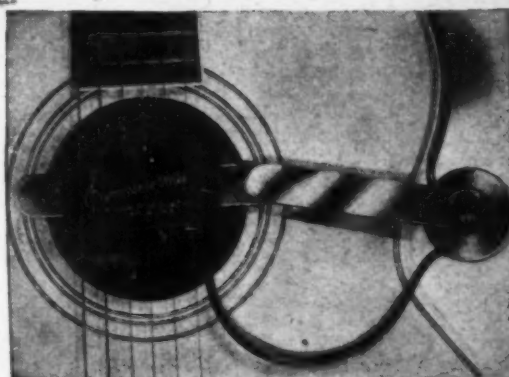
Model 4A—for "F" hole

Check and Compare these Features

- ✓ Incorporates the New "AL-NICO-V" Magnet
- ✓ Reproduces String Activity only
- ✓ Fuller, Richer, More Vibrant Amplification
- ✓ Highest Level Consistent With High Fidelity
- ✓ More Value for less Money
- ✓ Fully Guaranteed for one year

Model 4A.....\$21.00
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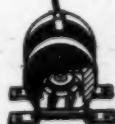
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Cut your service time on tough repair jobs to minutes with the Feiler Signal Tracing Analyzer! Just "listen in" on or "look at" the signal as it progresses through the circuit—Isolate and locate trouble in just minutes! Traces trouble at First Grid, R.F., I.F., Audio; tests parts and locates faults. Features: High Impedance Isolation Network; R.F. vacuum tube voltmeter circuit provision for visual indication of R.F. voltages; Output meter provision; Headphone connection; Full 5" PM Speaker; 1" dia. bakelite probe, with 3 ft. cable; handsome brown-finished metal case with carrying handle. Requires only 3 economical long-life batteries for self-contained, portable use. A professional instrument for the serviceman who wants the best at a moderate price. Complete with valuable Radio Service Guide.



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D.C. Mils... 0 to 100... in 3 ranges
A.C. Mils... 0 to 250... in 3 ranges
Ohms... 0 to 2,000,000 in 6 ranges
Output... 5 ranges

The Multiplex Model 458, built to high industrial standards, is priced remarkably low—only \$26.00 net. Write today for new circular.

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under R. C. Walker, president and general manager.

Mr. Craig, who became associated with *Aireon* in 1942, is the company's attorney. He is secretary and director of *Cinaudagraph Speakers, Inc.* and of *Mid-Tool and Supply Co.*, operating subsidiaries of *Aireon Mfg. Corp.*

REMLER COMPANY LTD., electronic and plastic manufacturers of San Francisco, has purchased the stock of retiring president E. G. Danielson, one of the original founders of the firm. As a result of this transaction, Robert Coleman Gray becomes the sole stockholder and assumes the presidency of the reorganized company.

In assuming his new duties as president, Mr. Gray announced the appointment of H. J. Myers as controller.

ALFRED LANDES has resigned as general sales manager for the *Monarch Sales Company* of New York, national distributors of *Electro-Tone* products.

Recently returned from a tour of duty in the South Pacific, Mr. Landes has now opened his own office under the name of the *Daval Company* in New York City. The company is at present handling products in the electronic, radio and appliance field.

M. W. GASNER has been appointed Canadian representative of the *National Electronic Manufacturing Corp.* of Long Island City, N. Y., makers of automotive antennas and automotive radio parts.

The territory to be covered by Mr. Gasner will include all Canada with the exception of British Columbia and will provide a complete and rapid service to *NEMCO's* Canadian outlets.

ALFRED E. KAYWORTH has been named sales representative for the *Belden Manufacturing Company* in their New England territory. Mr. Kayworth will handle all of *Belden's* automotive, radio and electrical lines for merchandise outlets in Maine, New Hampshire, Vermont, Connecticut, Massachusetts, Rhode Island and New York.

Until his eastern appointment, Mr. Kayworth was stationed at *Belden's* Chicago plant.

Belden's sales expansion program has also brought about the appointment of Chester J. Frey as sales representative for the eastern sales district of the Buffalo, Syracuse and Pittsburgh areas.

GENERAL ELECTRIC will soon have in operation eight "roving radio laboratories" installed in colorful trailers and equipped with electronic testing and repair facilities for a variety of radio communication services.

These "laboratories on wheels" will leave the company's electronics plant at Syracuse, N. Y. to operate from Albany, New York, Boston, Cleveland, Chicago, Philadelphia, Kansas City, Atlanta, and Dallas.

Outlets now available for new radio communication services and the

RADIO NEWS

growth of radio in the fields of public service, safety, transportation and industry have necessitated the establishment of these roving laboratories for field service operation.

SAMUEL HEYMAN, former production manager of *Aerovox Corporation*, has been appointed factory manager for the *Tobe Deutschmann Corporation* of Canton, Massachusetts.



Mr. Heyman will have full responsibility for manufacturing all *Tobe Products*. One of his first duties will be the expansion and modernization of the electrolytic capacitor division.

ROY S. LAIRD, vice president and sales manager of *Ohmite Manufacturing Company*, Chicago, was recently elected chairman of the Association of Electronic Parts and Equipment Manufacturers, to succeed J. A. Berman of *Shure Bros.*

Les Thayer of *Belden Manufacturing Company* was elected vice-chairman; Miss H. A. Staniland of *Quam-Nichols* was re-elected treasurer; and Ken C. Prince was re-elected executive secretary.

-30-

Television Antenna

(Continued from page 29)

roof for each of the television stations in the area. Each antenna is made as directional as possible to a single station. The antennas are then connected to an r.f. booster amplifier mounted right on the roof with them. The output of the amplifier is fed in turn down to the various apartments by a single coaxial cable. It is quite obvious that such an arrangement would help much for physical discrimination, eliminating the mass of wires crisscrossing each other that would be the result of each apartment owner setting up his own antenna.

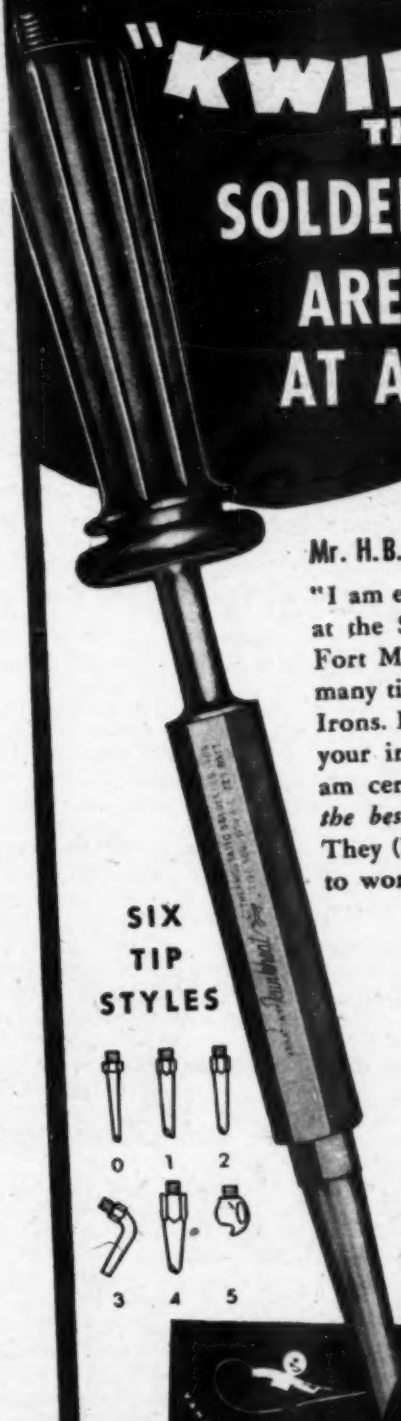
Other experiments designed to help in minimizing reflections are being performed with the aid of planes cruising about six miles in the stratosphere. A low powered ground transmitter is used to send the program to the planes circling slowly overhead and the planes, in turn, transmit the program back to the earth. It has been proven in these experiments that such transmission greatly improves the reception of the program as far as the question of ghosts is concerned. However, until such arrangements become the rule rather than experiments, the problem of the elimination of reflections is right back in the lap of the service man, the "ham" and the radio engineer.

As the second cause of reflections, the transmission line was mentioned. It is imperative in the operating of any type of television receiver anten-

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na that the signal be restricted to the elements of the antenna only. In other words, the lead-in from the antenna to the receiver must take the form of a transmission line that has no signal pick-up. If in spite of all precautions, some reflections do occur as a result of some signals picked up, damp them out by terminating the line in its surge impedance.

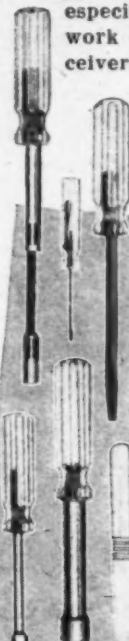
Three types of transmission lines are available for connecting the antenna to the input of the receiver; the parallel wire type, the twisted pair type and the coaxial type. Take your choice as to which you will use. Each has its own merits and staunch supporters. If your selection is the parallel type be sure that a fixed spacing is maintained throughout. In addition, make this spacing small in comparison to the operating wavelength to prevent appreciable radiation and yet not too small lest when the wires swing with respect to each other in a wind the line constants be caused to vary. Spreaders will answer the problem of fixed spacing. In many magazines published these days one will note the advertising of a type of feeder now available on the market which consists of two conductors spaced apart by a plastic ribbon. Different sizes with corresponding impedances can be purchased and it might be mentioned in passing that very favorable reports have been received from users of this type of parallel wire transmission lines.

The twisted pair type has a surge impedance of from 50 to 150 ohms and its high value of attenuation is excellent for suppressing unwanted reflections if, by any chance, a mistake is made in termination. If the transmission line is very long, however, say over 50 feet, difficulties will be encountered in the use of the twisted pair. The high value of attenuation mentioned will then cause a serious loss of the desired signal strength resulting in a weaker image. When such is the case, use the coaxial type with its low attenuation and insensitivity to signal pick-up. The attenuation in the coaxial type is from .01 db. to .05 db. per wavelength as compared to the 1 to 2 db. per wavelength in the twisted pair.

When the simple dipole is used as the antenna, a transmission line having an impedance of the order of from 50 to 150 ohms will render satisfactory performance. The average resonant impedance at the center of such a dipole varies from 72 ohms for a half-wavelength to 125 ohms for three-and-a-quarter-wavelengths. It is true that a mismatch is present in coupling a line of the impedance just stated to the center of a dipole but it will be found by experience that no serious loss of signal will result. However, very few television users are going to get by using the simple dipole as is. Directors and reflectors are going to be wanted and in most cases needed. If your requisition or order calls for such, remember that the impedance of the dipole drops considerably with

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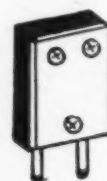
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We can supply crystals in various frequencies between 1,500 and 3,500 K.C., also 4,000 and 5,000 K.C. in holders at 79c each. Let us know your requirements.

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the addition of each new element. Use matching stubs, concentric line matching sections or a delta matching transformer to compensate. Of the three, the third is about the easiest to install.

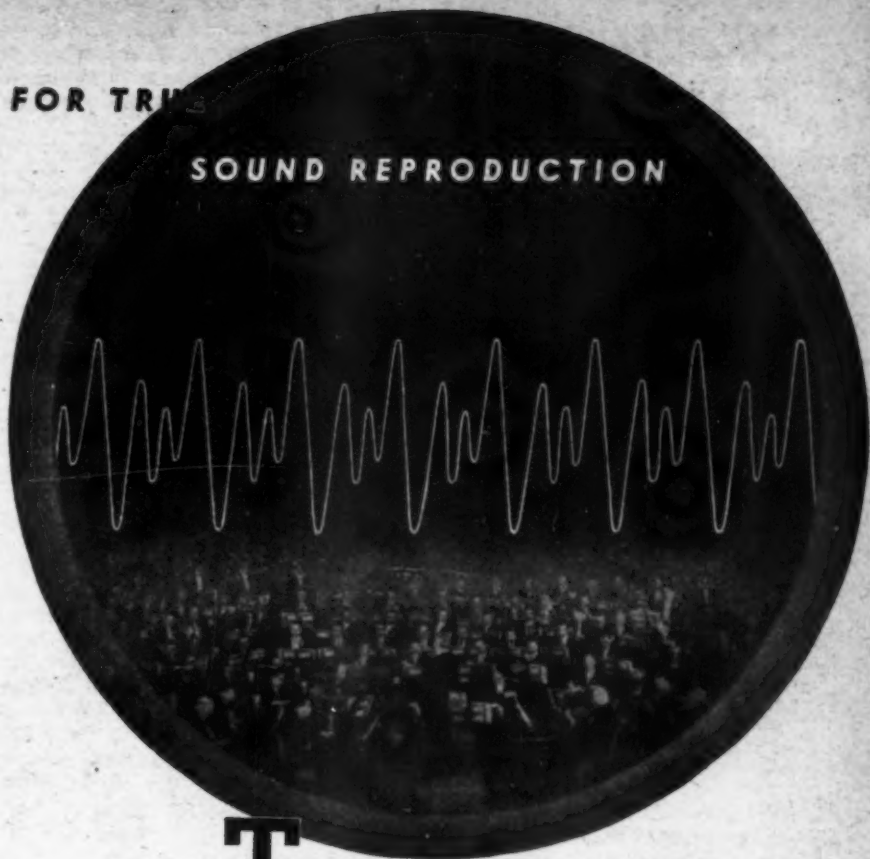
At the other end of the transmission line, if the input circuit of the receiver consists of an antenna coupling transformer, as is usually the case in television receivers, the impedance of the primary coil must match the transmission line impedance. Reflections will result if this match is not at least approximate and if the primary coil is not balanced with respect to ground. These reflections can produce ghost images on the screen as the result of waves traveling back to the antenna and then returning to the receiver with a delay in time proportionate to twice the line length. If care has been taken, however, in matching the impedance of the primary coil to that of the transmission line, little or no difficulty of this nature should be encountered. The balance between the primary coil and ground is essential with both the twisted pair and open wire types of transmission lines so that any unwanted signals picked up may cancel out each other. Coaxial transmission lines eliminate this problem altogether inasmuch as such a line is unbalanced in itself. The sheath of the coaxial type being grounded allows such a line to be connected to an unbalanced primary in the input transformer of the receiver.

The foregoing treatment of reflections was written more or less with reception in large cities in mind. However, television users dwelling in areas where trees and foliage are plentiful will attest to the fact that with the advent of spring, picture quality drops off markedly. All through the winter reception may have been very good but as soon as the foliage begins to appear on the surrounding trees, the pictures have become weak and in some cases very unstable. There is every reason to believe that foliage does act as an effective barrier for television frequencies. It would appear that this phenomena is caused partly by the physical effect of the presence of the leaves and partly by the moisture content increasing in the trees due to the rising sap. Bell Laboratories have reported strong standing wave patterns existing on the edge of wooded areas, especially in the warmer months. Here again, if your friend or client has his home in such surroundings, the problem will have to be met by shifting and orientating the antenna until the best possible reception is obtained.

By way of summary then, we cannot stress too much the importance of a good antenna for the reception of the video signal. The general public has to be sold on this. They must be shown that a little time and money spent on the proper construction and erection of the antenna will pay large dividends on the television screen. Convince them that a lot of

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





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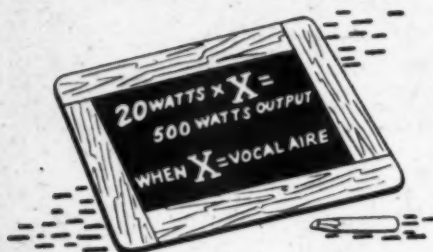
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Norwalk, Conn.

money spent for an extra good receiver is money wasted if they are going to be content with a make-shift antenna made from a piece of wire that happened to be lying around the cellar.

Auto-Transformer Design (Continued from page 47)

be put on the core in series with the present primary winding to obtain the various potentials desired.

Assume that the transformer is re-assembled. If we now apply 115 volts across points A and X, (See Fig. 1A) the voltage across points C and X would be arrived at by the proportion:

$$115:386=x:460 \text{ then } x=137 \text{ volts.}$$

This value would be satisfactory for the upper limit of our variable voltage but if 115 volts is applied across points C and X the value of potential across A-X would be arrived at by $115:460=x:386$ then $x=96.5$ volts. This value is somewhat higher than is desired so it is evident that more windings must be added to the top side of the present winding in order to achieve lower values across A-X.

Now if we assume an additional winding (see Fig. 1B) from points C to D to E to F and we apply 115 volts across X-F we may arrive at the following proportion:

$$115:x=78:386$$

then: $x=571$ turns

where: x = the unknown total winding from X to F.

$$115 = \text{line voltage used}$$

78 = the lowest voltage that we assume we can obtain across A-X without making the total winding too large.

386 = the number of turns across A-X

Then by using the above system of proportions we may obtain a series of equations similar to the above for the points X-F, X-D, X-C, X-B. For example:

$$115:(571-37)=x:386$$

where $x=83.5$ volts or the potential across A-X.

This will give a series of values which will be obtained for the output across A-X when the line voltage, 115 volts, is applied successively across points X and F, E, D, C, B, and A. This might be achieved by a rotary switch operating on the primary side, so to speak, (see Fig. 1B) and would be satisfactory for a voltage range from 78 volts up to 115 volts. This, however, would not allow for any values above 115 volts. By using the arrangement shown in Fig. 3 whereby a rotary switch is used on both sides of the winding, so to speak, a much greater range of potentials is obtained.

Referring to Fig. 3, if we set switch, S₁, on point F we may rotate S₂ through points A to E and obtain voltages from 78 volts to 115 volts, as is the case in Fig. 1B. If, however

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H.V. Condenser .5 Mfd 2000 V....	1.95
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3 Gang 410 Mmf. Per Sect. Cond.	
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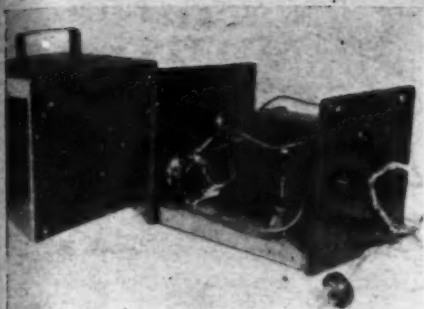
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RADIO NEWS



Auto-transformer with cover removed.

we set S_1 on point C we will get an intermediate range of voltages by then rotating S_1 through A to F . This may be shown by the following equations:

$115:460=x:386$, where $x=96.5$ volts with S_1 on A , and $115:460=x:423$, where $x=105$ volts with S_1 on B , and $115:460=x:460$, where $x=115$ volts with S_1 on C , and so on through points D , E and F .

For the high voltage range S_1 would be set on point A and then we would get a series of equations as follows:

$115:386=x:386$, where $x=115$ volts with S_1 on A , and $115:386=x:423$, where $x=126$ volts with S_1 on B , and $115:386=x:460$, where $x=137$ volts with S_1 on C , and so on through points D , E and F . This top range is somewhat higher than we wanted and could be lowered by using a different combination of settings for S_1 . For instance, by using three points nearer the top of the winding for the contacts for S_1 , we could obtain a lower range but this would also result in very nearly duplicating some of the values on other ranges. This would probably be desirable in some cases where the steps of voltages would be closer but the over-all coverage would not be so great. In any case this is at the option of the individual since it is obvious that a fairly wide range of various potentials is available by manipulation of the two switches. If two six-point switches were used, it is evident that an even greater number of combinations may be achieved. In this particular construction it was not deemed necessary or desirable, so a three-point switch was used for S_1 , and a seven-point was used for S_2 , with one position on S_2 used for an "Off" position.

Construction of the Unit

After the necessary computation was completed as shown in the previous section, the additional winding was added to the original primary. If the paper insulation between the original primary and secondary windings has not been broken or damaged it may be left on but if any damage has been done it is better to remove it all carefully and replace it with new. Transformer cloth was used in this case, one layer being used and this being held in place with scotch tape until the windings were started. The new winding was then applied being careful to use the same winding



XL PLUG CONSTRUCTION MEANS LONG LIFE



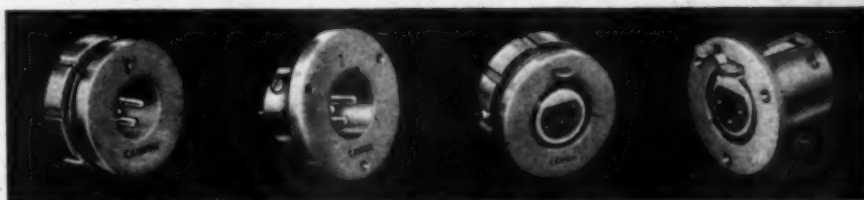
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YEARS OF EXPERIENCE and success building multi-contact electric connectors have gone into the design and manufacture of this new line of "XL" fittings for low-level sound transmission circuits and other general electrical uses.

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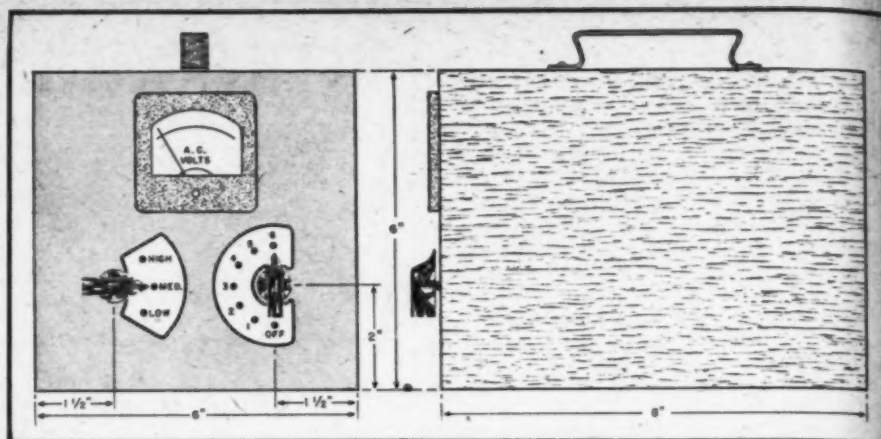


Fig. 2

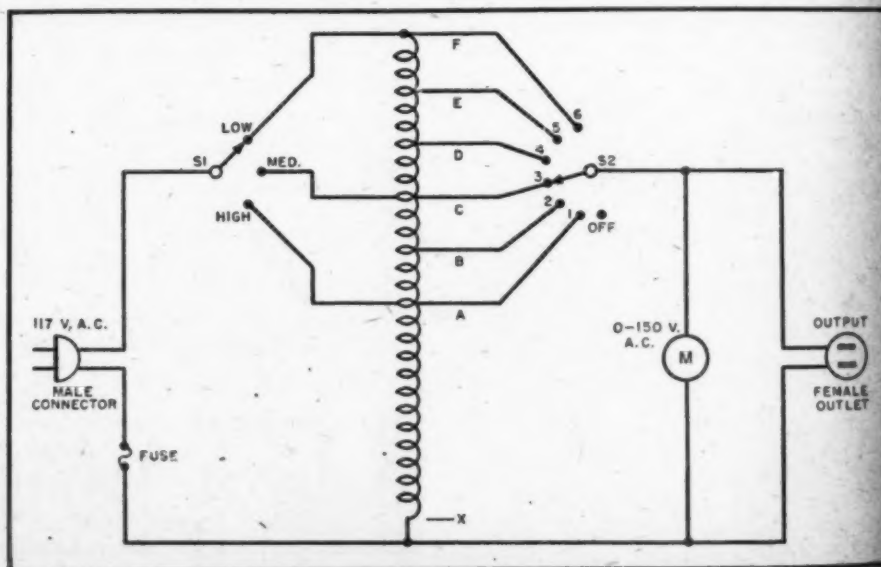
direction as the old winding. Number 18 enameled wire was used as it was available new and was determined to be sufficiently large to carry the current. The cross-section of this wire is 1624 circular mils and when figured at a rating of 1000 circular mils per ampere will allow for a continuous duty rating of at least 1.5 amperes. In all of the previous computation no allowance was made for transformer losses since these will be inconsiderable in a transformer of this size and type unless it is overloaded a great deal. This new wire may be applied fairly easily by un-reeling a length and securing it in a vise and then winding the wire on the core by rotating it in the hands and walking up to the vise. By repeating this procedure as many times as necessary a good tight job will result and if care is taken it will approach a commercially wound transformer in compactness and neatness. When enough turns have been applied to make a tap on the winding, six inches of wire may be doubled back on itself and twisted around to secure it and then the winding may be continued.

When this new additional winding is applied no great care with insula-

tion is necessary as the voltages involved are relatively low. One layer of insulating paper between layers of wire was deemed sufficient. Fish paper, transformer cloth, (varnished cambric) or even a good grade of waxed paper may be used. At every 35th to 37th turn bring out a tap until the total additional winding of 111 turns is arrived at. A turn or two in 37 is not critical so no great care must be exercised in getting exact numbers of turns between taps.

The transformer was mounted in a box made of wood and plywood. The sides and ends are made of 1/4" plywood and the top and bottom of 3/4" pine. Dimensions are shown in Fig. 2 if the exact duplicate is desired, but if any other cabinet of similar dimensions is available it might easily be used. The front panel was made of black bakelite and the various components are mounted as shown. If it is desired a fuse holder may be mounted on the front for easy accessibility, a 3 or 5 amp. fuse being used and this is wired into one side of the line. Similarly, if a pilot light is desired it might be mounted on the panel to make a balanced panel arrangement. A 115 volt night lamp could be used with one of the large

Fig. 3



one inch bull-eyes used for a holder. This should be wired across the rotor of S, and point X on Fig. 3.

The switches used on this unit were the heavy duty wafer type but it would be advisable to use a heavier duty type such as Ohmite model 212 especially if a higher wattage transformer were used. This switch is rated at 15 amps. at 150 volts and will provide a good safety factor for this auto-transformer. The meter is an inexpensive type 0-150 volts a.c. and should really be incorporated for maximum convenience although it is not absolutely necessary. At the rear of the cabinet an ordinary 115 volt outlet is provided for the output and a five foot length of lamp cord with a plug is used for the input circuit.

This unit will prove to be a great convenience for the average home workshop or ham shack, as its versatility has proven its worth in everyday usage.

-30-

Sound Amplification

(Continued from page 39)

This tremendous saving in weight and volume is obtained with no reduction in range or intelligibility. Both units deliver approximately the same output power.

There are four principal components of the new air-stream-modulation equipment; the power unit, a 2-stage audio amplifier, a modulating valve assembly, and a conventional loud-speaker horn.

The power unit consists of a gasoline engine which drives a 250-watt, 500-volt d.c. generator and a rotary-type air compressor. The air compressor develops approximately 10 lbs. per square inch pressure with a volume of 10 cubic feet per min.

The audio amplifier (Fig. 2) is designed to deliver 15 watts of audio power, with not more than 10 per cent harmonic distortion at 1000 c.p.s. The output tube is a dual pentode, type 829-B.

The mechanism for converting the amplified electrical waves to audio or sound waves is the modulating valve, the heart of the air-stream-modulation system, by which compressed air is modulated.

When a volume of air is compressed, it contains potential energy which will escape whenever expansion or release is permitted. Discounting any inherent resonant effects of the volume, if the air is allowed to escape in a continuous flow there will be no generation of audio waves. However, if the stream of air is modulated at a rate within the audible range, sound or audio frequencies will be generated.

Modulation of the air stream, however, is not a simple matter. A diaphragm arrangement is not acceptable. A large diaphragm would be required at the throat of the loud-speaker horn, and it is difficult to

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10 mfd. 50 v.....	29c
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drive a large diaphragm equally over its entire area, also there are extraneous phase effects which are troublesome. The principal problem in achieving high output power with any conventional electromagnetic diaphragm is that a relatively large amount of power must be applied in order to create a sufficient movement of air to carry sound over long distances.

A more desirable method of modulation is an air valve forceful enough to operate against the air stream in one direction, and yet withstand considerable pressure when moving with the air flow.

The necessary moving column of air is supplied by means of an ordinary air compressor, similar to those used to inflate tires at automobile service stations.

Utilizing essentially the same principles as are used by the human larynx, the stream of compressed air is modulated as it escapes via the horn into the atmosphere.

This modulation is accomplished by an important component, the *Dilks* modulation valve (Fig. 1). The valve is operated by a permanent magnet solenoid coil.

The modulation valve consists of two slotted grids, one of which is the armature and is actuated by the solenoid to produce the variations in air pressure according to the amplified speech signals. The slots in both grids are .003 inches wide, separated by intervening bars or reeds .015 inches wide.

The armature or modulating grid is controlled magnetically and moves alternately nearer to and farther from the slot openings in the fixed grid.

When the valve is closed, the reeds of the modulating vane cover the slits in the fixed grid, and there is no passage of air through the modulation valve.

Maximum movement of the modulating vane is .0006 inches, and passage of the compressed air through these grids causes the air stream to be modulated, according to the slot openings.

The valve operates typically with 8 to 12 pounds pressure, supplied by the air compressor associated with the power unit. The rate of flow of air through the valve is delicately balanced since the mean value of the slot opening is determined by that pressure. The greater the pressure setting, the greater the opening of the grid slots. This permits high efficiency of operation, since extremely small armature movements may be employed.

Used with a conventional loudspeaker horn, 10 inches in diameter and about 18 inches long, sound is projected into space, under normal conditions, with 95 per-cent intelligibility or better at distances from 2 to 3 miles along the axis of projection.

Maximum undistorted acoustic power output, measured on an axis at 30 feet, is approximately 114 db. above .0002 dynes per square cm.

RADIO NEWS

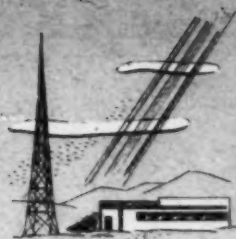
75 Watts in One Cubic Foot

(Continued from page 38)

front of the chassis, with the 815 in the upper right corner next to the grid tank shield can. The final tank condenser is mounted so that the shaft will clear the sides of the cabinet when mounting the unit into the cabinet. A coupling and a short bakelite or polystyrene shaft allows the dial to be mounted on the right side of the cabinet. The condenser was mounted in this manner, although the rest of the tank condensers are pretuned, to allow variations arising from coupling rhombics and "clothes lines" to the rig. The 815, being approximately 5 inches in height, was lowered 1 1/4 inches below the subpanel to allow clearance at the top of the cabinet. A small "U" shaped sub-chassis was built for this purpose. As mentioned previously in the construction of the power supply, sufficient room will be available for lowering the tube in this manner if care was taken in the placement of the transformers. Neutralizing condensers C_3 and C_4 for the 815 consist of two small metal sheets 1/2 x 3/4 inch in area connected to 2 pieces of No. 14 enamelled wire extending upward parallel with the tube from the chassis. Needless to say, they should be crossed underneath the chassis before being brought up to the side of the tube. The wire is about an inch in length and the metal plates were constructed by cutting in half the metal identification band that is wrapped around 10 watt resistors.

Operation

In operation, the e.c.o. band set condenser should first be set to the desired frequency by using a calibrated frequency meter. The frequency shift condenser should be at approximately half capacitance to allow for upward and downward shift from the original setting. The e.c.o. plate tank, the doubler tank and the final grid tank are then tuned to resonance in turn, with the coupling link to the grid tank set at maximum transfer of current. The final plate tank circuit should then be neutralized by moving the small metal tabs in and out until all indications of r.f. are removed when the plate tank is tuned through resonance, without the final plate voltage, of course. Next the final tank is coupled tightly to a dummy antenna, the plate voltage applied, and the tank tuned to resonance. The plate loading should be adjusted until the amplifier draws twice the carrier plate current, noting the antenna current at the same time. The coupling of the link should then be decreased until the plate current starts to drop. The grid bias should now be increased until the plate current drops to proper carrier current. The antenna current at this point should be approximately half of the initial reading. A few adjustments of antenna coupling, excitation and



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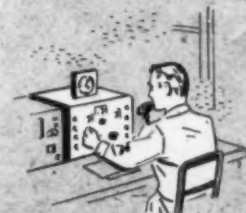
GEOPHYSICAL SURVEY



MUNICIPAL SIGNAL STANDBY



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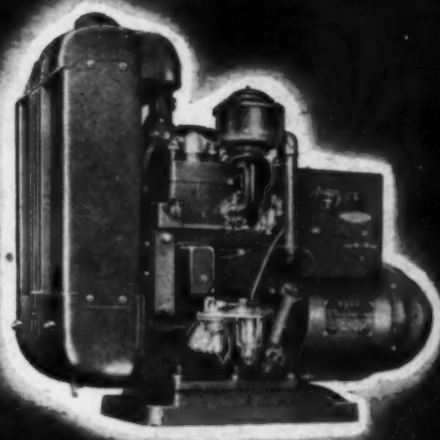
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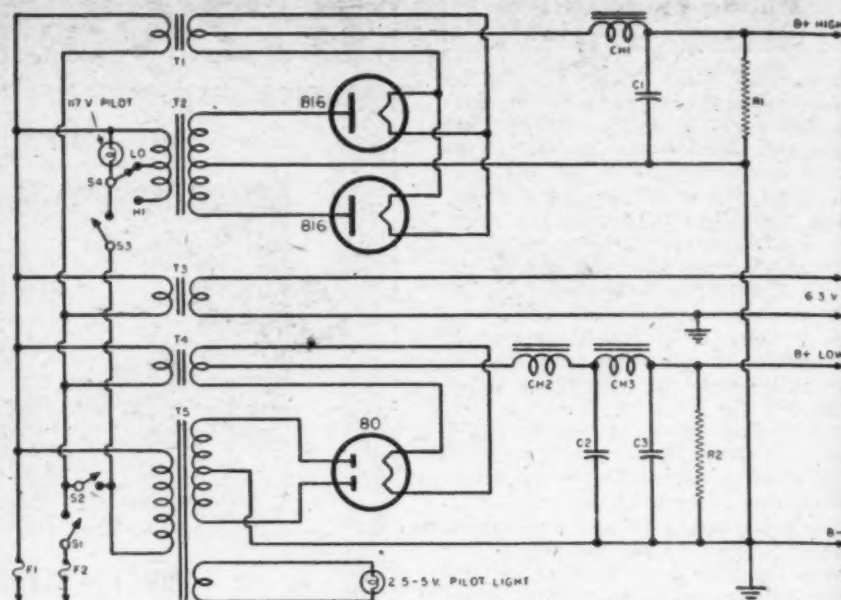
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R₂—50,000 ohm, 50 w. res.

C₁—2 μfd., 1000 v. elec. cond.

C₂, C₃—8 μfd., 450 v. elec. cond.

CH₁—10 hy., 250 ma. filter choke

CH₂, CH₃—20 hy., 150 ma. filter choke

T₁—Fil. trans., 2.5 v. @ 4 amp., c.t.

T₂—Plate trans., 500-0-500 v., 750-0-750 v., 250 ma. (tapped pri.)

T₃—Fil. trans., 6.3 v. @ 5 amp.

T₄—Fil. trans., 3 v. @ 2 amp., c.t.

T₅—Power trans., 300-0-300 v. @ 150 ma.; 2.5 v. or 5 v. @ 1 amp.

S₁, S₂, S₃—S.p.s.t. toggle sw.

S₄—S.p.d.t. toggle sw.

2—816 tubes

1—80 tube

Schematic diagram of power supplies for 10-meter rig.

grid bias will probably be necessary, however, no undue trouble should be encountered in getting the amplifier modulated. After all adjustments are completed and satisfactory, an antenna should be coupled to the plate tank through a suitable tuning arrangement. The plate current will vary from 5 to 10 ma. under modulation, however, this is quite normal and does not indicate over-modulation and subsequent splatter.

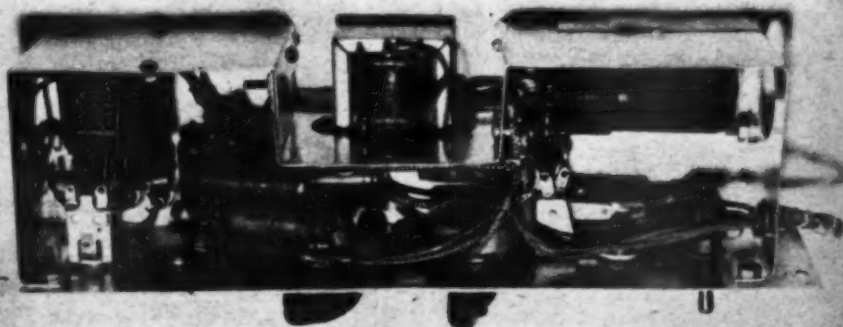
A word or two on the operation of the rig on c.w. should be appropriate at this time. For c.w. operation, the key plug is inserted into the key jack on the panel which automatically shorts the modulation transformer and keying is accomplished in the grid circuit of the oscillator. The coupling to the grid tank should, of course, be

adjusted for maximum transfer of r.f. A 1 1/4 inch vent hole cut in the back of the cabinet allows this adjustment to be made with the minimum of trouble. The voltage to the speech equipment should be disconnected by the switch provided for this purpose when operating on c.w.

Although this transmitter was built to fulfill our specific needs, that of a small rig, easily movable, with adequate power to compete with the moderate power rigs, there is no need to confine the transmitter to such close quarters when space is available and transportation unnecessary. Moreover, while being limited to the 10 meter band, it can easily be adapted for use on the lower amateur bands if so desired.

—50—

Under chassis view of audio section of transmitter.



**Unusual
Phone Transmitter**
(Continued from page 35)

not working. With application of an audio frequency voltage, the negative one-half cycle of audio voltage from the modulation transformer causes the power amplifier tube to be grid-modulated from the carrier level downward. Upon completion of the negative one-half cycle of audio frequency voltage, carrier level output is restored. With the application of the positive one-half cycle of audio frequency voltage, the plate current of the sideband generator tube is increased because the grid is swung in a positive direction.

The positive one-half cycle of audio applied to the sideband generator tube is increased because the grid is swung in a positive direction.

The positive one-half cycle of audio applied to the sideband generator grid lowers its impedance to such an extent that more radio-frequency excitation power is required from the buffer amplifier. This reduces the excitation applied to the grid of the power amplifier tube and tends to cause a reduction in its plate current.

This reduction in plate current is offset by the fact that positive audio-modulating voltage is applied to the grid at the same time. With the completion of the positive one-half cycle of audio frequency from the modulation transformer, and the upward or positive peak of modulation, the plate current of the sideband generator tube is decreased to practically zero because of the high value of grid bias. The grid impedance is raised back to a high value, and maximum r.f. drive is again applied to the power amplifier, thus restoring the circuit to carrier condition of no modulation. Therefore, the power amplifier tube may be considered to be supplying the carrier power and negative modulation peaks, while the sideband generator tube supplies the power required for upward peaks of modulation, above carrier level.

**REPLACING
RADIO CHASSIS**

Before the radio chassis is replaced in the cabinet after testing or making repairs—check as illustrated to determine if all wiring and units are well inside the chassis.

Wires left outside the chassis may be pinched upon installation and cause short circuits or damage parts. H.L.

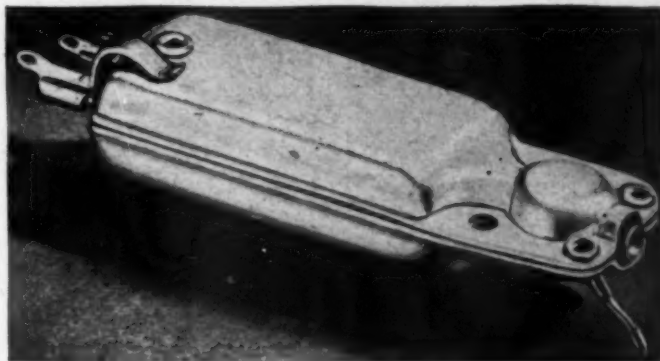


December, 1946

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For the Record (Continued from page 8)

The use of public address equipment and intercommunication systems will greatly increase in the next few months and years. Someone will have the job of keeping this equipment in repair, and there is no reason why this function cannot be adequately performed by the independent serviceman. These devices, as a rule, are not particularly complicated, and do not require extraordinary skill or expensive equipment to service. A good way to handle work of this kind is on a contractual basis, that is, the radio serviceman agrees to keep a particular system in an office or factory in repair for so much per year. Another way is an "on-call" basis, wherein the repairman will be called on when trouble occurs. Many times the alert serviceman can secure the job of making the original installation, and can actually sell the idea, if not the equipment itself.

These are only a few of the many, many things which can be done not only to keep the serviceman in business, but to cause his business to grow, and grow rapidly, while he himself makes only a very small, if any, investment in time or money studying about FM, television, and ultra-high frequency equipment. O. R.

Practical Radio Course (Continued from page 41)

minimum. In such receivers, use of a type of converter tube that has least noise consistent with other desirable characteristics is advantageous.

Problems in Choosing Type of Frequency Converter to Be Used in a Receiver

The construction and operation of the different popular types of mixer and converter tubes were described in the last few articles of this series. It was shown that although the method of operation differs in some types of tubes, the general principle of frequency conversion employed in all types of tubes and with all methods may be considered as being the same, i.e., a small percentage amplitude modulation is produced. Between various tubes and methods of operation, the differences in other inherent characteristics are so marked, however, that each application and the selection of the particular type of commercial mixer or converter tube to be used in a given type of receiver under consideration during design must be considered as a special and individual problem. The method of operation and type of tube to be employed must be intelligently chosen to meet the most important needs of the application. In making such a choice it is usually necessary to make practical compromises, for no one type of mixer

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or converter tube that is best for all types of receivers has yet been developed.

Comparison of Operating Characteristics Obtained by Three General Modes of Frequency-Converter Tube Operation

At this point, it will prove instructive to summarize, in a qualitative way, a few of the important operating characteristics that result from each of the three general modes of frequency converter tube operation:

1. Single-electrode input.
2. Double-electrode input with inner-grid oscillator injection.
3. Double-electrode input with outer-grid oscillator injection.

The tabulation⁴ in Table 1 presents the data for a few of the more important operating characteristics. The appraisals presented are largely a matter of opinion based on experience and the present state of knowledge. Furthermore, in particular circuits and with particular commercial tube types, the relative standings may sometimes be quite different. However, a careful study of this tabulation should prove very instructive in a general way.

Summary of Mixer and Converter Tube Characteristics

First, the decision as to whether a mixer, or a converter tube will be used depends upon such factors as the space available, receiver cost, source of cathode-heating current (batteries, line, etc.), signal-frequency range of receiver, frequency-stability required, etc. The decision regarding the particular commercial type of tube to employ as the mixer or converter also depends upon these factors and other additional ones such as conversion gain produced by the tube, oscillator-frequency stability with a.v.c. bias voltage and terminal voltage fluctuations, tube noise produced, loss of gain at highest frequencies in operating range of receiver, etc.

Consequently, the summary of important operating characteristics of the popular general types of mixer and converter tubes presented in Table 2 should prove instructive and helpful.⁵ The conversion gain figures and the remarks concerning the comparative oscillator stability of the various tubes listed are particularly important.

The conversion gain,⁶ which depends on the variation of transconductance of the tube over each cycle of the applied local-oscillator voltage, was calculated on the basis of the use of a tuned load impedance of 200,000 ohms—which is approximately that of the better types of i.f. input transformers now available. The equation is:

⁴ E. W. Herold, "The Operation of Frequency Converters and Mixers for Superheterodyne Reception," *Proceedings of the IRE*, February 1942.

⁵ Values of Conversion Transconductance and A.C. Plate Resistance appearing here obtained from RCA Receiving Tube Characteristics Chart.

⁶ For an explanation of conversion transconductance and conversion gain of a frequency converter see Alfred A. Ghirardi, *Practical Radio Course*, Part 43, RADIO NEWS, June 1946.

December, 1946

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$$\text{Conversion Gain} = \frac{g_p \times r_p \times R_L}{r_p + R_L}$$

where g_p is the conversion transconductance in μmhos , r_p is the internal a.c. plate resistance of the tube, in megohms, and R_L is the effective series dynamic resistance of the tuned plate load circuit at resonance, in megohms.

In general, the following desirable characteristics are those most generally striven for in good frequency converter design:

1. High conversion gain with reasonable uniformity on all tuning bands.

2. High oscillator output of uniform amplitude and good frequency stability.

3. Freedom from interaction between signal and oscillator circuits.

4. Low tube noise.

Some of these desirable characteristics (for example, maximum conversion gain and minimum tube noise) are not obtainable together in any existing type of frequency converter tube. Consequently, the receiver designer must evaluate the relative importance of each in the particular receiver under consideration, and compromise accordingly when selecting the type of mixer or converter tube to be used and when working out the design of the oscillator and signal circuits to be associated with it.

Examination of the foregoing tabulation shows that the conversion gain realized in most popular types of converter tubes ranges approximately from 35 to 75. A low conversion gain in a frequency converter is not necessarily indicative of poor design, for in many receivers, a slight sacrifice of conversion gain (particularly during reception on short-wave bands) is deliberately made by reducing the oscillator signal strength, thereby reducing the variation in signal-grid-to-plate transconductance of the tube caused by each cycle of the oscillator voltage. This makes it possible to achieve a lower noise level and therefore a better signal-to-noise ratio. The conversion gain can also be reduced by increasing the negative bias applied to the signal grid.

(To be continued)



"Raise the aerial a little higher, Gus!"

RADIO NEWS

International Short-Wave

(Continued from page 126)

concert on Monday and Friday; chamber music, Tuesday; a play, Thursday; opera, Saturday; and operetta selection or bright music, Sunday."

The new Norwegian station using 6.130 has been broadcasting special tests at 12 noon-1:30 p.m. and 3:45-5 p.m. asking for reports by cablegram, and calls itself "Fredrikstad Shortwave Transmitter." Cables, however, should be sent to "Studio Oslo." Other channels announced are 6.180, 9.540, and a new transmitter on 11.735. (Skoog)

HJCA, 4.857, Bogota, Colombia, is heard to sign-off at 10:37 p.m.; all Spanish. (Norris)

Brussels, 17.845, is heard most days around 12:55 p.m. in a transmission to Leopoldville; no English noted. Radio Brazzaville, 17.530, usually signs on at 11 a.m. (in French). Radio Espana Independiente on about 17.262, is heard 2:30-2:52 and 3:30-3:52 p.m., perhaps at other times; signs on and off with music. (Harris)

OIXI, 6.118, Helsinki, Finland, is heard in Sweden, 10 a.m.-4 p.m.; no English reported. (Carl-Eric Petersson)

VUD7, 15.160, Delhi, good in Pennsylvania, 9:15-10 p.m. (Black)

Card verie (black and white with call letters and details in French) received from HH2S, Port-au-Prince, Haiti; also got a colorful job in blue and brown from YV5RN, Venezuela; WLWK, Cincinnati, verifies with a mimeographed card. (Norris)

LKY, 9.540, Oslo, Norway, is heard in Sweden, 5:45-7:25 a.m.; the 6.200

POSSIBLE NOISE SOURCES

BALLAST tubes or plug-in voltage dropping resistors are used in many radios to regulate the current and lower the voltage for the regular tubes.

Since this tube or resistor operates at a fairly high temperature, poor contact at the prongs may result in improper functioning and noise.

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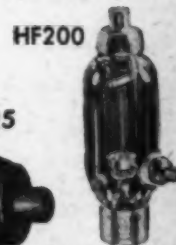
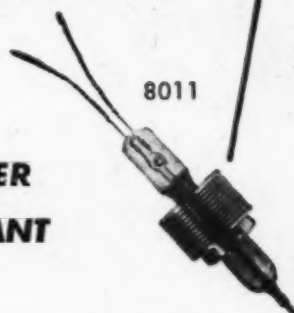
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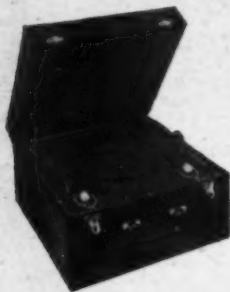
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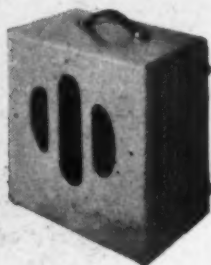
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CSX, 6.370, Lisbon, Portugal, is heard in Sweden closing down at 6 p.m. (Carl-Eric Petersson)

Radio Dakar, 15.345, French West Africa, was heard recently signing on at 1:45 p.m. (Harris)

Via airmail from Rex Gillett, DX editor of "Radio Call" (South Australia), come these tips: JCV, Tokyo, is in relay with JLR, 6.015, carrying AFRS programs in the mornings; frequency of JCV is 3.075; it is at poor level. Soerabaya has been reported as the location of Dutch-speaking station heard on 3.200; signals are good about 8:30 a.m. with musical program. A call sounding like XGOE has been heard on about 9.820 about 8 a.m.; typical Chinese programs are presented; location is unknown at present. Schedules of Radio Tananarive, Madagascar, are officially given as weekdays at 11:30 p.m.-12:30 a.m., 10.615, 9.693, and 6.138; 3:30-5 a.m., same frequencies; 10-11 a.m., 10.615, 6.138, and 4.370; Sundays, 3:30-5 a.m., 10.615, 9.693, 6.138; and 9-11 a.m., 10.615, 6.138, 4.370. Address is Le Chef du Service General de l'Information, Tananarive, Madagascar. Letter from Radio Luxembourg states power is 6000 watts, also that they are to add further English programs. Deputy P.T.T. Representative, De Katstraat, Bandoeng, Java, in verifying a report on PLY, 10.060, wrote Mr. Gillett that PLY is one of the prewar 3-kw. commercial transmitters of the Netherlands Indies P.T.T. Administration; the station was testing and relaying programs from "The Official Dutch Radio Station in Bandoeng," being heard on about 2.970; it now seems to be on the air regularly, heard from around 6 to about 9:30 a.m., good signals. Radio SEAC, Colombo, Ceylon, lists frequencies of 3.395, 6.075, 9.520, 11.770, 15.120, 17.770, and 21.620; last two were heard recently testing from 8:45-9:30 p.m. and 9:30-10:15 p.m., respectively. Tests on 9.520 some weeks ago resulted in poor signals in Australia, largely due to this channel being used by VLW7, Perth.

A letter from Mlle. Yelitzia Theodor, Roumania, indicates that there is widespread interest in Europe in Eddie Startz' Happy Station Programs over PCJ, Hilversum, Holland, Wednesdays and Sundays. Incidentally, in addition to the excellent signals heard here in the East between 10-11:30 p.m., PCJ comes through nicely now on 15.22, 10:30 a.m.-12 noon, and over 11.730, 4-5:30 p.m., with 9.590 only fair in that period. (Eddie Startz is very grateful to WLWO, The Crosley Corporation, Cincinnati, for the fine cooperation in making it possible for PCJ to have a clear night channel to America.)

The Jaffa, Palestine, station on 6.135, 6.710, and 6.790 is heard signing off at 3 p.m. (Skoog)

Swedish observers report a new station on about 6.210 around 12:30-2 p.m., announcing as "Radio Rumania Libera"; uses American popular re-



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RADIO NEWS

Last minute tips from Paul Dilg, California, list *Radio Makassar* as jumping around a great deal lately, last on 9.260 (has varied to as high as 9.400), with their announced 5.060 (actually 5.030) frequency being more constant. Most of the Chinese stations are erratic and drift in frequency from day to day. XGCA is now on 9.730 with a weak signal in the 9 a.m. *English* news; XGOL, 9.995, fair signal, also has *English* news at 9 a.m., signs off at 10 a.m.; XNCR, now on about 7.520, Yen-an, opens around 7 a.m. and signs off at 8:30 a.m.; XGOE, location unknown, 9.820, has not been heard on West Coast lately; Hangchow, XOPD, 3.553, seems to have made some changes, sign-off (or break) of first transmission is at 8 a.m., but comes back on at 8:30 a.m. and leaves the air (or breaks again) at 9 a.m. An unidentified Chinese on 6.050 (also reported by other monitors) may be relaying XORA, Shanghai, relays Chungking *English* news at 9 a.m. *Radio Saigon's* evening transmission on 11.778 is again audible on the West Coast, 6:15-7:30 p.m., but there is a bad heterodyne. VUD, 6.100, Delhi, is now scheduled 8:30-9:15 a.m., *English* news (at dictation speed) is heard at 9 a.m. The British Somaliland station on 7.126 is again audible with a weak signal, heard until after 10 a.m. Siam's 5.990 frequency signs off at 9:45 a.m.

BBC frequencies directed to North America from 5 a.m. to 11 p.m. are GWH, 11.80, 5-6 a.m.; GSP, 15.31, 6-8:15 a.m.; GVO, 18.08, 8-11:15 a.m. and 12 noon-4:15 p.m.; GSP, 15.31, 4:15-7:45 p.m.; GWH, 11.80, 4:15-9:45 p.m.; GWO, 9.625, 4:15-11 p.m.; GWN, 7.28, 5-6:45 p.m.; GRH, 9.825, 5-11 p.m.; GVZ, 9.64, 7-11 p.m.; GSL, 6.11, 7-11 p.m.; and GSU, 7.26, 7:45-11 p.m.

XMTA is the call of a new station on 12.217, heard in Australia opening with a strong signal at 6 a.m. daily, with an anthem; also heard at 5 p.m., but weak; location unknown. (Gillett) *(I believe this is XLPA, Changsha, China.)*

December, 1946

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Collins Transformer Mfgd Ckt. PRI 115/50-60Hz	
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Chokes.....	7.95
Same combination PRI Input 115V/230V 50/60Hz	
Raytheon cased 850VCT/110ma; 530VCT/21ma;	
24V/3A; 5V/3A.....	2.50
(528).....	2.50
Two for \$4.50; Five for \$10. 25 for.....	45.00
Same with 2-10Hy/110ma cased.....	3.95
Chokes.....	4.75
Chokes Hmclty cased 10Hy/400ma/80ohms.....	4.75

RCA AMP. IN-CRG New Q14, T14	7.5V
400p. plate 1500V/200 uA	Rated
140 watts output each "UHF"	(List
\$7.75) "TAB" price \$2.75 @	\$5.00
2 GEAW5077JAN (92.75)	\$1.35
60, 2 for	2.50
829H/3C29 JAN Boxed G'd	4.50
4 socket	
CH125 2 for	1.25
2 for	1.25
RCA956 JAN (LP \$5) & socket	1.25
805/905 JAN & socket \$6, 2 for	11.00
GE825 new g'd & socket \$7.50	
60, 2 for	14.00
GE 448A/2C40 Lighthouse	
tube (\$11)	6.95
807 G47 JAN H.V. 16300V	7.00
(\$3.40)	
RCA G47 JAN boxed new, 4 for	3.00



WE 307A HF Pentode (LP \$13).	58.95
WE 330A HF Pentode (LP \$24)	8.95
WE 308A tube UHFH 20 Watt 1700mc's new	7.95
WE 303A tube UHFH 20 Watt 1000mc's new	5.95
WE 717A Door Knob tube new (\$7.50)	1.95
957 or 958A Acorn tube JAN & socket.	1.25
2C26 JAN new UHFH (LP \$5) boxed.	1.05
RC1213 Raytheon new FW 300V/15amp (LP \$24)	7.95
GE 1041/RK600 new FW H.V. Rect (\$2.75)	1.95
GE 860A & Johnson 2nd H.V. socket 2 for.	2.90
872A JAN & socket, Two for.	5.95
872A JAN & socket, Two for.	5.95
RCA-VR130 JAN new (LP \$2.80) .75 @ 2 for.	1.30
RCA 30 JAN (LP \$1.20) .65 @ 2 for.	1.10
RCA 187G JAN (LP \$2.80) 1.50 @ 2 for.	2.50
RCA 634 JAN UHFH (LP \$8.10)	2.49
6G5/6U5 Ray tubes (LP \$1.95) 2 for.	1.00
3A4 Tungrol JAN new (LP \$2)	1.65
6AG5 JAN (LP \$2.80) .75 @ 2 for.	1.30
6AK5 JAN new boxed (\$4.12) 2 for.	2.00
GE Vacuum Condor 50mmfd 16000V	3.95
58P1, 58P2, 58P4 New Gl'd JAN & socket.	1.95
58P1, 58P4 New Gl'd JAN boxed.	0.95
6SN7 JAN new (\$1.55) .80 @ 2 for.	1.45
6J5 JAN new boxed (\$1.10) .55 @ 2 for.	1.95
9006 JAN new boxed (\$1.25) .70 @ 2 for.	1.45

plug	rubber cord & PL-55	\$.75
S.C. Headsets \$2.25 @ Two for.....		5.00
S.C. J45 Key less cord & plug \$5c @ Ten for...		4.50

NEW McFLOY S.C. AN/
GSC-T Code practice set
& Trunk portable, operates
on 6, 12, 24, 115VDC
& 115, 230VAC. For
classroom, club, camp,
military, police, air force,
Ham, etc. Teaching send
& receive. Both visual
(thinker) and earphone,
loud speaker, aud freq
tone. Self cont'd room for
phones, 25 keys and 10
100 students. Complete
with tubes 2/6646.
6X3GT/G. Easily adapted
to amplifier public ad-
dress. Power supply with
two vibrator worth price
alone. **Special**
\$19.95 with 5 keys &
Headsets\$39.00
S.C. J45 Key with 6 ft.

TRANSCEIVER TRY NAVY
28 to 80mc's PORTABLE
Complete all tubes & NEW
Navy vibrator pack & non
spill Willard 10amp/PH/4.2V storage battery
chargeable from 6V 5' Bat.
Voice & CW, self contained xtal spec calibrated
pts. Continuous 28 to
80mc's, adaptable 112
mc's. Complete incl. edi-
whip, ant, phones, mike,
shoulder carrying case,
tubes 2 No. 30, 3 No.
058A, 059, 2 No. 177,
CR1005 excellent for ma-
rine, police, forestry, utility
broadcast & Amateur use. Complete with manuals.
NEW SPECIAL \$39.95 @ 2 for..... \$72.00
Try Navy Vibrator pack & 8' Battery..... 9.95



WE 115V/60Hz, P-4, 440V/CT or 1360/1650V no	
CT 300ma, 440V/CT classed \$4.95 ea. 2 for \$7.00	
Condnsr oil A-XV 1510 0.3mfd/1500WVDC 2 for 1.15	
Condnsr oil CD TLA 2mfd/600WVDC 2 for.....	.79
Molded .01mfd/600WVDC 100 for \$7.50 ; 1000.30	6.00
Condnsr Wg oil 16mfd/400WVDC \$2.50 2 for.....	1.00
Condnsr 10mfd/600WVDC (2/2.5mfd & 3mfd)	2.50
2 for.....	2.50
Condnsr 20mfd/600WVDC (1-2.5-3-5mfd).....	2.50
Condnsr GE 3mfd.....	2.50
Condnsr 10mfd/600WVDC WACD 2 for.....	4.25
Condnsr 3mfd/2000WVDC 2 for.....	2.00
Condnsr 10mfd/600VAC/2000WVDC GE (\$22)	5.75
Condnsr 15mfd/600VAC/2000WVDC GE (\$29)	3.90
Condnsr 2mfd/12500VAC Westhse (\$210)	25.00
Condnsr 1mfd/2500VAC.....	75.00
Condnsr 2mfd/12500VAC oil Insulators 2 for.....	4.00
Condnsr 25mfd/1000VAC wlg new 3 for.....	.75
GE oil 0.1mfd/1500WVDC .65 ;	
0.1mfd/3000WVDC.....	1.25
GE 0.1mfd/750VDC \$4.50 ;	
0.01mfd/3000WVDC.....	2.95
.01mfd/1300WVDC M/Tubular oil, 10 for.....	1.50
.02mfd/600WVDC M/Tubular oil, 10 for.....	1.10
Condnsr mlea .01mfd/2500V Test (\$3.40) 2 for.....	1.10
Condnsr mica .001mfd or .000WVDC (\$12) 2 for.....	1.45
Condnsr mica .000WVDC (\$12) 2 for.....	1.45
Condnsr mica .000WVDC-CP TLA.....	1.45

WE 200 microamps $3\frac{1}{2}''$ Rd bbl case.....	\$4.95
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Westgase elapsed time Indicator 115V/60cy.....	4.50
Weston-.60 to .01B 500/600ohm line.....	3.95
Weston 475 Sq $3\frac{1}{2}''$ B case 150VAC GI'd (\$10).....	4.25
Weston 475 Sq $3\frac{1}{2}''$ B case 150VAC GI'd.....	3.00
Weston 475 microammeter 100 microamps $3\frac{1}{2}''$	
B Case.....	8.95
Socket Amphelen S8TN Octal HF 25 for.....	1.50
Daven attenuator "T" Pad 600/600.....	4.95
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Socket Hammarlund Accus 900; 4 for.....	1.00
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Busse & Little fuses 2AG/250ma, 48 for.....	1.00
GR Variac 100G/2KW L.N. GI'd.....	25.00
WE 200 microamps 2K L.N. GI'd.....	19.25
WE 200 microamps 2K L.N. GI'd.....	9.95
Dieheptal socket & Adj ring.....	.49
Johnson No. 224 Ceramic UX socket 4 for.....	1.00
National XC-5 Ceramic $3\frac{1}{2}''$ socket 4 for.....	1.00
National mixed G&P grips $3\frac{1}{2}''$ & $1\frac{1}{4}''$ No. 8.....	2.50
Heavy duty duty of 1000V 16 AWG.....	1.00
Resistor Kit 100B $\frac{1}{2}''$ & 1W 50 to 2 meg.....	2.50
Condor Kit gty allvacilla 50 for.....	2.00
Control Kit Type AB-J 50 to 1 meg Ten for.....	2.00



NEW NAVY DYNAMOTORS EICOR DC G'd Overseas
packed. AN Insp H-e-f. Cont. duty Inpt 12V/8A or
24V/4A. output 500V/30ma. Inpt name, output 273V/
110ma & 12V/3A.

EITHER UNIT \$1.95. Or both units (2) & filter **\$3.49**
Wet bldg: 7 3/4" L x 2 7/8" H x 4 1/4" W. Adaptable to
6V operation.

V			OHMS
0-3			1000
0-10			10000
0-30			100 M
0-100			1 Meg.
0-300			10 Meg.

ELECTRONIC VOLT-OHM-METER 11meg SENS NEW
S.C. 1-107-F PRECISION UNIT "TAB" special \$24.60
additional V.T.V.M. Loctal tube 1LE3/EP SigC \$1.15

"TAB" • Dept. N12, Room 200, 6 CHURCH ST., N. Y. 6, N. Y. • U.S.A.



PRECISION ELECTRONIC REGULATED POWER SUPPLY

Immediate Delivery
Type A:—Variable from 210 to 335
V.D.C. at 400 M.A.
Type B:—Variable from 535 to 915
V.D.C. at 125 M.A.

Built for the U. S. Army as part of power supply of RA-57-A, but never used. Adapted to civilian use by mounting on 12 1/4" or 14" x 19" panel, black or grey crackle finish, & installing meters, brackets, chassis, pilot lights, switches, fuses, etc. Fits any standard 19" rack or cabinet. Complete with tubes and ready to plug in. All units checked and inspected at 150% of rated load before shipment

Specifications:

Input: 115 V. 50-60
Regulation: Less than 1/10 V. change in output voltage with change from 85 to 145 V.A.C. Input voltage & from no load to full load (over wide latitude at center of variable range)
Ripple: Less than 5 Millivolts at all loads and voltages.

Tubes used in Type A: 2-836; 6-6L6; 2-65F5; 1-VR150; 1-VR105.
Tubes used in Type B: 2-836; 2-6L6; 2-65F5; 1-VR150; 1-VR105.

Construction Features:

Weston 301 (or equal) ammeter & voltmeter Can vary voltage by turning small knob located on front of panel.

Separate switches, pilot lights & fuses for filament volts & plate volts.

All tubes located on shockmount assemblies. Fuses mounted on panel & easily accessible. Rigid construction. Individual components were designed to withstand the most severe military conditions & are greatly under-rated.

Some of the current users of these power supplies are:—electronic laboratories; aircraft, metallurgical & chemical research labs.; technical schools; commercial & amateur radio stations, etc.

NET PRICE:

Type A—\$175 F.O.B. Baltimore

Type B—\$168 F.O.B. Baltimore

Subject to change without notice

Approx. shipping weight, 100 pounds

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Reisterstown Rd. & Cold Spring Lane
Baltimore 15, Md.

RADIO CABINETS RADIO FURNITURE JACK CANTOR

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Specify SAUERISEN ACIDPROOF CEMENTS—COMPOUNDS FOR

Tanks, Sewers, Stacks, Floors
Technical cements for all purposes.

Send sketches or samples

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and 17.82, with 820 kcs. (medium-wave), 9.57, 11.89, and 15.44 added between 7:45-8:15 a.m.; 6:20-9 p.m., 7.24, 7.30, 9.48, and 6.02, with 7.36, 11.89, and 15.17 used from 6:20-7:30 p.m. English newscasts are normally scheduled for 7:30, 8 a.m., 6:30, 7:30, and 8:30 p.m.; Moscow Newsreel is heard at 7:45 a.m., 7 and 8 p.m. To England, 11 a.m., 15 min., 19-, 25-, 30-, and 31-meter bands; 12 noon, 1/2 hr., 19-, 25-, 30-, and 31-meter bands; 1 p.m., 1/2 hr., 30-, 31-, and 41-meter bands; and 5 p.m., 1/2 hr., 31-, 40-, 41-, and 49-meter bands (this one is heard well in the U. S. on 9.760).

ZQI, 4.700, Kingston, Jamaica, has strong signal on East Coast, 4:30-6:32 p.m.; headline English news is at 6:30 p.m. (Ferguson)

An English period is being heard from Italy over "Radio Italiana," Milan, between 1:20-2:10 p.m.; announces frequencies of 11.810 and 9.630; identifies as "The New Republic of Italy, Rome." (Grivakis)

A new AFRN station from Japan is being heard with a good signal in Australia on about 4.880, as early as 4 a.m. to closing at 9 a.m., in relay with JLR, 6.015, and JZC, 3.075. JLP, 9.605, is being heard best around 3:30 a.m., again is announcing as AFRN. (Gillett)

VUM-2, listed as on 7.255 but actually higher (7.265), Madras, India, is being heard in Louisiana at 7:30 a.m. relaying the English news from Delhi. (Crandall) Is also heard in California by Dilg who reports the schedule now as 5:30 a.m.-12 noon.

JLW2, 9.505, Tokyo, is being heard best in the East around 4:45 a.m. during the English lesson period; is heard in Japanese some mornings as late as 6:30 a.m.

CR7BE, 9.715, Lourenco Marques, Mozambique, heard going off the air at 3:30 p.m. with the Portuguese National Anthem; English news is scheduled for around 2:50 p.m. (Ferguson)

According to the British Short-Wave League, a British listener reports a station in Ankara, Turkey, heard at 12 noon on about 3.895 with an R-5 signal through heavy CWQRM.

Radio Kuala Lumpur, 6.175, Malaya, is scheduled 11:30 p.m.-1:30 a.m. and 6:30-11:30 a.m., according to Swedish sources; uses 110-foot "delta matched dipole."

Address of Radio Monte Carlo (operating on 6.130) is 18 Bd. Princesse Charlotte, Monte Carlo, Monaco.

In a letter received by Rex G. Gillett, Australia, from an official of the Netherlands Indies Government Information Service, Capel Court, 375 Collins Street, Melbourne, C. 1, Victoria, Australia, it was stated that "Radio Makassar, Celebes, broadcasts in English each Monday, Wednesday, and Friday at 8:30 a.m. on 9.3575. The broadcasts are intended to give a picture of life in the Celebes by means of news bulletins, commentaries, and music."

An airmail letter from Eddie Startz of PCJ, Hilversum, Holland, indicates

DEALERS! SERVICEMEN!

Just in time for Xmas.

Singer RECORD PLAYER

Constant-speed rim-drive AC motor. Dynamic Speaker. 50L6 Output. Attractive Finish. Aluminum shielded case. Plays 10" and 12" records.



Your Price—with Tubes **\$13.95** less tubes **\$11.95**



Singer TOASTER

Handsome, sturdy, chrome-plated steel. "Flip-Flip" type. 500 watt element.

YOUR PRICE **\$4.58**

O.P.A. Ceiling \$6.10

IMMEDIATE DELIVERY

Money-back Guarantee

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METER BUYS

Ranges:

0-15 Ma. D.C.

0-100 Ma. D.C.

0-300 Ma. D.C.

0-5 Amp. R.F.

0-9 Amp. R.F.

YOUR CHOICE **\$3.95** each

A really swell buy in Westinghouse 2 1/2" flange type meters, brand new, black face, white letters. Reg. net from \$7.00-\$14.00. Ask for surplus list #RN-1.

ALFRED C. DENSON,
38 Park Place,
ROCKVILLE, CONNECTICUT.

ELECTRONIC VOLT-OHM METER

\$11.85

110 VOLTS AC 20 RANGES

0/5/10/50/100/500/1000/5000 volts DC and AC. 0-1,000,000,000 ohms in six overlapping ranges. Sensitivity: over MILLION OHMS per VOLT on 5 volt range.

POSTPAID

Complete kit includes all component parts, tubes, punched and drilled chassis and beautifully enameled panel. Easily assembled and wired.

Special slideback circuit developed during war by scientist at the California Institute of Technology gives amazing sensitivity and flexibility while completely eliminating necessity of batteries and expensive meter. Each instrument is individually calibrated. Dial scale over nine inches long!

In addition to performing the usual volt-ohm functions, this instrument easily measures these voltages: SUPERHET OSCILLATOR, AVC, AFC, TRUE GRID BIAS AT THE GRID, BIAS CELLS without affecting the circuit. Measures the exact leakage resistance of INSULATION, TUBES, CONDENSERS. It can be used with a signal generator for SIGNAL TRACING.

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PEN-OSCIL-LITE

Extremely convenient test oscillator for all radio servicing; alignment • Small as a pen • Self powered • Range from 700 cycles audio to over 600 megacycles u.h.f. • Output from zero to 125 v. • Used by Signal Corps • Write for information.

GENERAL TEST EQUIPMENT CO.

38 Argyle

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that "work at the station continues with good results. The program is getting more popular every month, and a steady stream of letters reaches me each week. Mail from America, however, is considerably less than I had expected, now that our 9.590 nite-wave is in the clear." Let's send Eddie more reports! His *Happy Station Programs* are heard Wednesdays and Sundays between 10-11:30 p.m. on 9.590, and can also be heard (in the East) with good level on same days between 10:30 a.m.-12 noon on 15.122. Address is Postbus 150.

The AFRS station at Quarry Heights, Panama Canal Zone, operating on 2.390, was recently logged at 8 a.m. with a program of dedicated recordings; gave call of WV. (Crandall)

Rex G. Gillett, Australia, reports he "heard a strange broadcast for two nights only, the last days of August, on about 15.830, with a call of WVT, British Commonwealth Occupation Forces' Station in Japan. The station was being officially opened by the Commanding Officer, Lt.-Gen. R. H. Robertson; the deeply modulated sig-

nals, the unusual frequency, and the fact that it was heard only twice suggest a technical fault causing the station to break through from the BCB on which I believe it normally operates."

"*Ravag, Radio Wien*," listed on 6.190, actually on about 6.195, Vienna, Austria, was heard recently at 12:20 a.m.; had setting-up exercises (in German) at 12:24 a.m., and the news in German at 1:45 a.m. (Kernan)

Finland signs on in evening with 5-bell tones repeated each minute to 7:15 when a woman announcer says, "This program is coming from Helsinki of the Finnish Broadcasting Company"; announces frequencies of 15.190 and 9.050, and schedule as daily, 7:15-7:30 p.m., consisting of news in English. (Grivakis)

BFN, 7.290, Hamburg, is scheduled 11:30 p.m.-5 p.m.; has English news (BBC) at 1 a.m., local news at 1:10 a.m.; verified an airmail report within 15 days, with letter verie. (Moss)

VUD-5, 15.190, Delhi, has good signal in 9:30 p.m. English news. (Seckler) Same is true here in West Virginia.

Phototype postcard verie has been

received from HOX, bearing miscellaneous "shots" around the transmitter; letter verie was received from the British Army of the Rhine (BFN) with a complete description of their history, set up in mimeographed form. (Norris)

Canton, 11.650, now carries Chungking English news at 9 a.m. A Chinese station being heard on about 6.05 to 6.10 is believed to be XRRA, Peiping (listed on 6.091); carries Chungking English news at 9 a.m. also, and signs off around 9:30 a.m. (Dilg)

COKG, 8.955, Santiago de Cuba, verifies with a letter in English and a "color photo." Letter states they relay CMKW which operates on 1000 kcs. with 5000 watts. The transmitter was built from G.E. parts by their chief engineer, Augustin Medero, and the transmitting tower is 220 feet high. COKG itself operates with only 500 watts. Its transmitter has a pair of 806's, plate-modulated with two 849A's. The antenna is delta type, 50 feet high; both stations are located on Quintero Hill, "ten minutes from Santiago." Opens at 6:30 a.m., off at 12 midnight; station is owned by

RHS TELEVISION-SCOPE-POWER EQUIP'T.

OSCILLOSCOPE KIT

5CP1 Cathode Ray Tube. Each.....	\$ 6.95
Socket for 5CP1. Each.....	1.98
Anode Button for 5CP1. Each.....	.35
Shield for 5CP1. Each.....	1.49
2X2A Rectifier Tube. Each.....	1.25
Plate Cap for 2X2A Ceramic. Each.....	.20
Socket for 2X2A Ceramic. Each.....	.25
Xformer, 1600v, 6.3v, 2.5v, 110v., 60 cycle. Each.....	7.50
Condenser, oil. .5-2000v. Each.....	2.10
Order separately or COMPLETE KIT. Special	16.95

HEAVY DUTY CHOKE

35Hy. at 270Ma. 105-Ohm D.C. Res. 6000v
Ins. Can deliver 400Ma.
Special **\$9.95**

OIL CONDENSERS: G.E., AEROVOX, C.D., Etc.

2mfd 600v.....	\$.60	4mfd 2000v.....	\$3.95
4mfd 600v.....	.75	10mfd 2000v.....	4.35
5mfd 600v.....	1.10	12mfd 2000v.....	4.95
1mfd 1000v.....	.90	15mfd 2000v.....	5.95
2mfd 1000v.....	1.05	.05mfd 3000v.....	2.95
4mfd 1000v.....	1.10	.25mfd 3000v.....	3.25
8mfd 1000v.....	2.00	1mfd 3000v.....	3.50
10mfd 1000v.....	2.40	2mfd 3000v.....	3.75
15mfd 1000v.....	2.80	.05mfd 4000v.....	4.35
6mfd 1500v.....	2.50	.25mfd 4000v.....	4.60
24mfd 1500v.....	6.95	1.0mfd 4000v.....	6.85
1mfd 2000v.....	.95	2.0mfd 4000v.....	7.60
3mfd 2000v.....	2.95	.1mfd 7000v.....	3.95

WESTON MODULATION METER

Mod No. 301-3" A.C. rectifier type 1000 ohms
per volt.
Exceptional buy at..... **\$3.95**

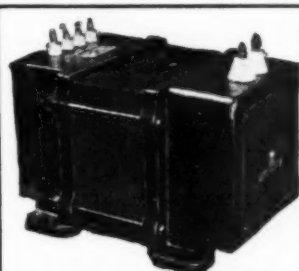
FEDERAL'S NEW MIDGET SELENIUM RECTIFIER

Replaces Rectifier-Type Tubes.
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All material is new and guaranteed unless otherwise stated.

TUBES: NEW JAN APPROVED

6C4.....	\$.75	9002.....	\$0.69
6J6.....	.85	9003.....	.69
866.....	1.15	9004.....	.99
813.....	0.95	1625.....	.79
1629.....	.75	125Q7GT.....	.30
6AL5.....	.75	811.....	3.25
6AG7.....	1.25	30.....	.89
6AR7.....	1.25	1E7G.....	1.25
12SK7GT.....	1.30	957.....	.99
6AR5.....	1.60	958.....	1.10
6AC7.....	.95	959.....	1.15
257B.....	14.95	6C5.....	.75
5BP4.....	8.95	125A7.....	1.55
		SOLEGY.....	1.30



AMERTRAN HEAVY DUTY PLATE TRANSFORMER

For your dream rig. Pri. 105-115v, 60 cycle. Sec. 3100-0-3100, full voltage across sec. 6200v at 700Ma. Rated 2KVA. **\$39.95**
Our Price.....

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MA **\$19.95**

MODULATION STAGE KIT

Driver Xformer
Pri.-Z-600 ohms
Sec.-Z-100000 ohms
Mod. Xformer
Pri.-Z-15000 ohms
Sec.-Z-4250 ohms
Ratio-1:13 1 KV Test at 235 ma.
Test 5kv. Will drive pair 813's
SPECIAL FOR PAIR..... **\$6.95**

XFORMERS, SCOPE & TELEVISION, 115v.-60cyc.

6500v at 4 ma.....	\$9.95
6000v at 2 ma.....	7.95
3950v at 4 ma., tap at 1250v-1 ma.....	7.50
3710v-10 ma.; 2.5v at 3A; 2.5v at 3A.....	9.95
2500v-10 ma.....	6.50
4000v-2 ma.....	6.50
2050v-2 ma.; 2.5v at 3A.....	8.95
1710v-7ma.; 2.5v at 3A; 6.3 at 3A.....	7.95
1600v-2 ma.; 6.3v at 1.75A.....	6.50
1600v-2 ma.; 2.5v at 3A; 6.3v at 3A.....	7.50
1230v-tap at 630v at 150 ma.; 500v at 2 ma.; 100v at 2 ma.; 6.6 at 8A; 6.3 at 6A; 5v at 3A; 2.5 at 1.75A.....	9.95

XFORMERS-FILAMENT 115v.-60c.

HI VOLTAGE INSULATION

2.5v at 1.75a; 6.3 at 1a.....	\$ 3.95
2.5v at 10 amps.....	3.25
2.5v at 2a, 6.3v at 1a.....	3.95
6.3v at 21.5a, 2v at 2a, 4v at 1a.....	6.95
5v at 115a.....	14.95
5v at 190a.....	17.50

FILTER CHOKES

Hi-Voltage Insulation

1 henry-200 ma-3000v Ins.....	\$2.25
4 henry-250 ma-3000v Ins.....	3.95
16 henry-250 ma-3000v Ins.....	3.25
12 henry-150 ma-2000v Ins.....	2.95
12 henry-300 ma-6000v Ins.....	3.95
15 henry-30 ma-1500v Ins.....	1.95
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Wants reports, at Apartado 82. (Moss)
AFN, 6.080 (or higher), Frankfurt,
Germany, is being heard 11 p.m.-12
midnight with recordings; has bad
heterodyne. (de Brier)

HER7, 17.784, Bern, has been heard
testing between 10 a.m.-12 noon, with
call and frequency given in German,
French, *English*. Used chime identi-
fication. Good quality with moderate
fade. (Duggan)

Java's 10.060 is not on Sundays nor
Mondays; now signs off around 11:10
or 11:15 a.m.; gives two wavelengths
at sign-off, 99.45 meters and 37.??
meters; reception grows poorer. (Dilg)

HP5B, 6.030, Panama City, has news
and comments in *English*, read by a
woman, at 7:30-8 p.m.; relays "Eng-
lish by Radio" at 8 p.m. and news in
Spanish at 9 p.m. (both from BBC).
(Beck)

Singapore, 11.850, is heard in Den-
mark at 6 a.m. with poor strength.
(Skerra)

Pat Casey, New York City, has just
received a typewritten verie from
Radio Eireann, Dublin, Eire; gave
schedule of the 1.5 kw. transmitter as
daily, 12:40-1 p.m. on 17.840; and 4:10-
4:30 p.m. on 9:595.

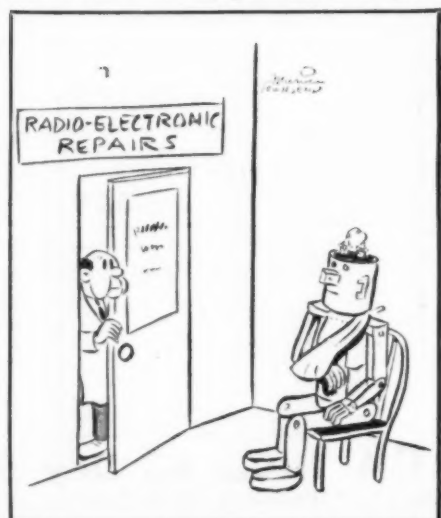
TAP, 9.465, Ankara, Turkey, is
scheduled 11 a.m.-4 p.m. (Gimby)
(Turkey should have reverted to
standard time by now, making broad-
casts one hour later than this.)

ZNR, 12.115, Aden, Arabia, has
finally verified; stated that broadcast-
ing has been suspended. (Legge)

Schedule of ZBW3, 9:570, Hongkong,
China, is reported 4:30-8 a.m. and
10:30 p.m.-12 midnight. (URDXC)
Power of the short-wave transmitter
is to be increased to 35 kw. from
present 2500 watts.

"Suedwestfunk," 6.321, Baden-
Baden, Germany, is being heard in
Sweden, 11:45 p.m.-1 a.m., 5:30-7
a.m., and 11:45 a.m.-3:45 p.m. (Moh-
lin)

HOLA, 9:505, Colon, Panama, was
first heard in September testing at
8:50 p.m. and announcing that they
were in parallel with HOL on 1390
kcs.; asked for reports to P.O. Box
44, Colon; call themselves "Radio
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RADIO NEWS

from XEWW and GSB. (Ferguson)

The Oslo, Norway, transmitter on 6.200 is heard in Massachusetts at 1:15 a.m. with news in Norwegian; is their National Program relay. (Kernan)

Radio Bucharesti, 9.252, Roumania, is heard in England between 10 a.m.-3:50 p.m.; English news at 3:45 p.m.; weak early part of transmission. Ljubljana, 6.537, Yugoslavia, is heard to sign-off at 4 p.m.; no English reported; uses cuckoo identification. (Harrison)

CSX, 6.374, Lisbon, Portugal, is scheduled 12:30-6 p.m. with 500 watts; CSW6, 11.030, is scheduled 12:30-3 p.m. and 4-6 p.m. with 10 kw.; CSW7, 9.730, is scheduled 7-8 p.m. with 10 kw. (Ekholm) (The last two are officially listed as using 50,000 watts each.)

HER3, 6.166, Bern, is heard 12:20-7 a.m., 12 noon-5:15 p.m. to Europe, North Africa, and the Near East; English news at 4:20 p.m. (Ekholm)

A flash from K. G. Frick, Sweden, indicates that the Vorarlberg, Austria, station on 6.203 (or a little higher) is being heard in Sweden, 12 midnight-1:45 a.m., 4:20-7 a.m., and 12 noon-5 p.m., announcing as "Osterreichische Sender-Gruppe West." Is in French Zone of Occupation and sometimes relays Radio Paris.

Wilbur Croston, Ohio, reports CNR3, 9.082, Rabat, Morocco, heard 12 midnight-3 a.m.; JCKW, 7.220, Jerusalem, Palestine, 1-3 p.m. (quite weak signal); SVM, 9.935, Athens,

Greece, 1-5 or 6 p.m. with special relays; a station believed to be HNF, Iraq, was logged recently on about 9.80 at 8 a.m.; VPD2, 6.13, Suva, Fiji Islands, was heard 3-4 p.m.; EQB, 6.155, Iran, heard twice lately, 9-10 a.m. (this may be the station reported for that time by Dilg, California).

Frequencies assigned to Dakar, with calls, are FHE2, 15.345; FHE3, 11.712; FHE4, 9.562; FHE6, 7.298; FHE7, 7.210; FHE8, 6.062; and FHE9, 4.893. Additional ones for Bern are HED5, 9.545; HED6, 9.655; HED7, 15.120; and HED8, 17.770. These are from Bern Lists. (Legge)

"The Voice of Free Indonesia" on 12 mcs. is coming through nicely in Louisiana from usual sign-on at 4 a.m. to sign-off at 6:15 a.m. (irreg.); this station is operated by the Indonesian Broadcasting Centre; English news is heard at 5:30 a.m. most mornings. (Miller)

Stations heard on 6.138 and 6.060, opening Sundays at 9 a.m., weekdays at 9:20 a.m., may be Radio Tananarive, Madagascar. (Dilg)

Radio Luxembourg, 6.092, is putting in a weak signal on West Coast, although is heard much stronger in Arizona; best on Sundays between 3-6 p.m. (in English). (Gould)

DPGH, 14.780, Nuremberg, Germany, is the 1 kw. mobile transmitter in a van that was used at Naples and Rome by the U. S. Fifth Army and in France and Germany by the Seventh Army; it was constructed in this country in

1943 and has traveled 5000 miles since then.

EPB, 15.100, Teheran, Iran, heard 6-7:15 a.m. with fair strength; English news is generally at 6 a.m. (Legge)

Radio Noumea, 6.208, New Caledonia, is heard on West Coast around 4 a.m. (in French); should be coming through in the East also. (Gould)

English sessions of Radio Rangoon, Burma, are now scheduled at 1:15-2 a.m. on 6.035; at 8:40-10:15 a.m. on 9.543; and at 8:15-8:45 p.m. on 11.840; news on 9.543 is now heard at 8:45 a.m. The schedule of the Burmese transmissions, as last reported, was 12:30-1:15 a.m., 2-2:30 a.m., 6:15-8:30 a.m., and 9-9:45 p.m., all on 6.035.

Prewar KZRM, Manila, has returned to the air on its old frequency of 9.570, but reception is poor due to severe interference from Hongkong and San Francisco on the same frequency. (Cushen)

ZFY, 6.000, Georgetown, British Guiana, now relays the 6:30-6:45 p.m. English news from Canada beamed to the Caribbean and West Indies by the CBC's International Service. A letter just in from Gerard V. de Freitas, of ZFY's staff gives schedules as Monday through Saturday, 5:45-7:45 a.m., 9:45-11:45 p.m., and 2:45-7:45 p.m.; Sundays, 5:45-11:45 a.m. and 2:45-7:45 p.m. The British Guiana United Broadcasting Co., Ltd., operators of the station, are now putting out a monthly "ZFY Radio Guide," and a



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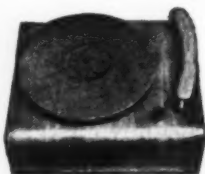
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Listeners' League has just been set up. Each applicant for membership in the League will be asked to serve as a monitor of ZFY's programs over a certain period each week, during which time a complete criticism of the program heard, and other details of reception will be kept on forms supplied for that purpose. A small number of monitors will be chosen to form a committee on which the station will have a representative so that the cumulative reports over a period may be studied and suggestions for improvements sent to the station authorities. These may be ideas for new programs, changes in existing programs, or the abandonment of unsuitable programs. The full cooperation between ZFY and its audience is the aim of the Listeners' League, of which John Hodges, acting British Council Representative, British Council Office, 5, Robb Street, Georgetown, British Guiana, is Honorary Secretary. It is interesting to note that monitors will be requested to report on the reception of their neighbors and friends to ZFY's programs as well as giving their own reactions on these programs. All postage expenses will be borne by the League, the only outlay on the part of the monitor is the giving of time each week to careful listening of the station's programs.

"Apia Radio," 7.700, Apia, Western Samoa, with a call of ZMB6, was heard testing in September, 12:05-1:05 a.m., signal strength was fair, but had considerable interference. (Legge) Also heard on West Coast. (Dilg, Balbi)

"Radio Labuan," Borneo, reported on 2.995 to sign-off at 10 a.m. (Skoog) Radio Hanoi, 11.900 and 9.600, French Indo-China, has English news at 6 a.m., but with very poor modulation. (Skoog) The Hanoi station has not been heard lately on West Coast. (Balbi)

HVJ, 11.685, Vatican, has been heard opening at 3:30 p.m. (Skoog)

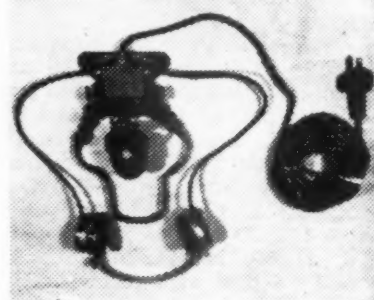
C. F. Bachman, Pennsylvania, reports official schedules of *Radio Congo Belge*, Leopoldville, as: 12 midnight-2 a.m., 9.380 and 6.282; 5:15-7:30 a.m., 11.720 and 6.282; 10:45 a.m.-4 p.m., 9.380 and 6.282; French and Flemish are principal languages used.

Late tips from August Balbi, Los Angeles, include VUD-2, 7.24, Delhi, heard 8:15-9:15 a.m., full schedule not known; JLW2, 9:505, Tokyo, signs off at 8:30 a.m., 4.91 and 4.93 heard irregularly to 10 a.m.; JLW, 7.285, and JWV, 7.26, heard from 2 a.m. irregularly, also JSL, 9.655, all in Home Service; an unknown Japanese on about 4.95, not in parallel with 4.91 nor 4.93, also heard irregularly.

The new Panama stations are now on a regular schedule of HOXA, 15.100, 7.5 kw., 12 noon-9 p.m.; HOXB, 11.810, 7.5 kw., 9-11 p.m.; it appears that HOXC, 9.660, is not scheduled at this time, although it was used in tests during late summer. (Davis)

FO8AA, 6.980, Papeete, Tahiti, is coming in with much improved signal on the West Coast, Tuesdays and Fridays, 10 p.m.-12 midnight, but has long

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RADIO NEWS

gaps between modulations. (Gould)

OLR4A, 11.840, Prague, is heard in Sweden with *English* news at 2:30 p.m.; sign-off is at 3:30 p.m. *Radio Belgrade*, 6.150, has *English* news at 3:30 p.m., sign-on is at 3 p.m., sign-off at 5 p.m. (B. Jonsson)

A letter verie from the BFN at Hamburg states that their station is actually located at Elmsborn, near Hamburg, and uses 50 kw. in the antenna, beamed to the west. (Cushen)

XORA, 11.698 to 11.705, varying. Shanghai, usually is a good signal here in the East in 6 a.m. *English* news.

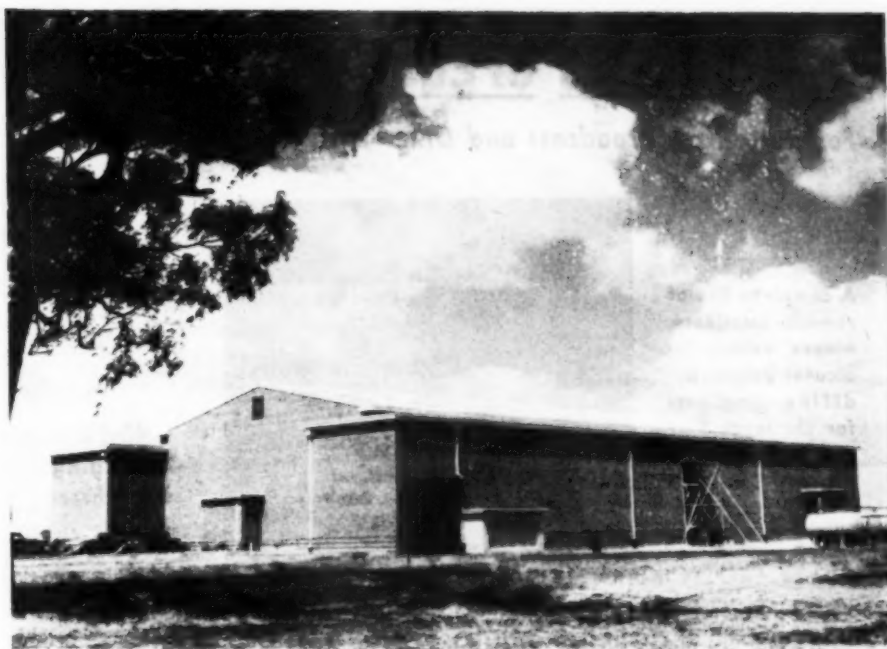
XGOY, 9.64, Chungking, appears to have returned to standard time, with *English* news now at 9 a.m.; the 11.920 frequency now has *English* news at 11 a.m. and signs off around 11:45 a.m.; the 9.64 frequency may soon be replaced by 6.154 (varying) for the winter months, as happened last year.

Eastern DXers who are early-risers will find *Radio Saigon*, 11.778, French Indo-China, puts in a good signal at 5 a.m. in their *English* news period.

XTPA, 11.650, Canton, inaudible here in the East for some months, is again heard poor to good early mornings; usually peaks around 7:30-8 a.m.

CSWI, 12.400, Parede, Portugal, is heard best between 4:30-5:30 p.m. sign-off, some days is good as early as 3:30 p.m. (Beck)

OIX5, 17.802, Lahti, Finland, is reported heard under Cincinnati afternoons; sign off Sundays at 4:05 p.m., weekdays about 5 p.m.



The present home of "Radio Australia." This picture shows the transmitter hall.

Radio Bandoeng, Java, appears to be using 8.000 (probably is PMD, 7.997) and 3.016 (approximate) in parallel with PLY, 10.060; not heard Sundays, Mondays. (Dilg) Is heard with weak signal here in the East. PLP, 11.010 (varying), also Bandoeng, usually is at good level here in the East early mornings, with peak around

7 a.m. when *English* is usually used; suffers bad CWQRM most mornings.

During the Peace Conference, *Radio Paris* broadcast a special transmission of news to North America daily, 5:15-5:30 p.m. on 11.700 and 11.847, good signals on both frequencies.

An airmail letter just in from Sven Lindhe, Stockholm, lists XGOY2,

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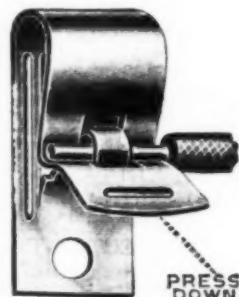
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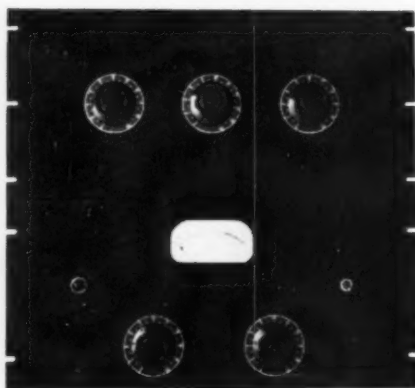
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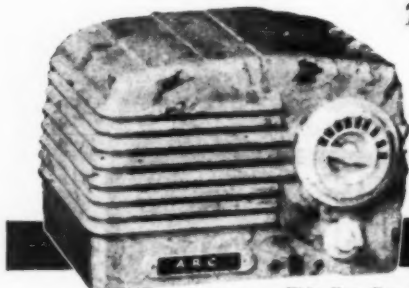
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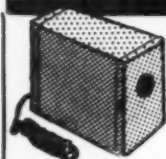
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11.918, Chungking, in *English* news at 10 a.m.; ZPA1, 6.274, Asuncion, Paraguay, 6:30-7:45 p.m.; ZPA5, 11.948, Encarnacion, Paraguay, 5:30-7 p.m.; XLPA, 12.217, Chengsha, China, heard 5:30-6 p.m.; CE960, 9.600, Santiago, Chile, "Radio la Americana," 5:30-6:45 p.m.; HI1N, 6.245, Ciudad Trujillo, Dominican Republic, 7:58-8:45 p.m. He also reports "Bregents," 6.140, 5:45-6:30 p.m., probably is "Radio Vorarlberg," at Dornbirn, Austria (listed on 6.139); and "Austrian-sender in the French Zone," 15.105, heard between 11 a.m.-12 noon, announcing calls of both "Munchen" and "Nyrnberg."

Radio Dakar, 11.715, is heard as early as 1:30 p.m. in Massachusetts. (Kernan)

The Swedish Radio is still asking for reports to Radiotjänst, Stockholm 7, Sweden (Sverige). Is expanding its facilities and programs. Better signals are reported in the U. S., particularly from SBT, 15.155, in the daily North American beam in Swedish and *English*, 10-10:55 a.m. SDB2, 10.780, is usually a good signal afternoons to around 5:45 p.m.

Prague's evening beam to North America, 7-7:30 p.m., over OLR5A, 15.230, has *English* news, read by a woman and fluently, at about 7:10 p.m.; the remainder of the beam includes news in Czech and music (often Slovak folk tunes).

The Press and Information attache of the Soviet Embassy in Washington reports that the Soviet Union has under construction a 100-kw. station; should be in operation early in 1947. (Strauss)

Radio Tananarive, 12.127, Madagascar, heard 6-6:30 a.m. in French. (Sutton)

Radio Polskie, 6.100 (varying), Warsaw, usually can be heard with news in Polish (at dictation speed), 7-8 p.m. sign-off. (Beck)

A last minute report from an East Coast monitor indicates that the special beam to Britain on Sundays from Radio SEAC, 15.120 (now announced as on 7.185, also), Colombo, Ceylon, is heard one hour later, 1:30-3:30 p.m. Excellent signal.

I find Singapore's 15.275 to be the most consistent frequency from Malaya during the late autumn, 4:30-9:30 a.m. sign-off; woman reads *English* preview at 4:30 a.m., *English* news is best in 6:45 edition; the 11.735 frequency is weak here, modulation being poor. Other frequencies announced as in parallel are 15.300 and 6.77 (last one is heard well in Louisiana).

Acknowledgments

ALBERTA—VE9AI. AUSTRALIA—Gillett, Radio Australia. BELGIUM—Salmon. BRITISH GUIANA—de Freitas, ZFY. CALIFORNIA—Balbi, Dilg, Gould, Crossley-Meates. COLORADO—Woolley. CONNECTICUT—Georges, Beauregard, Farmer. DENMARK—Skerra. DISTRICT OF COLUMBIA—Howe, URDXC; Havlena, Scully. ENGLAND—Bear, ISWC;

Harrison, Harris. FLORIDA—Mohr. INDIA—All-India Radio. INDIANA—GNSWLC, Green. KANSAS—Seckler. LOUISIANA—Crandall, Miller, Smith. MARYLAND—Weyrich, Grivakis. MASSACHUSETTS—Harris, Beane, Simonian, Kernan, French. MICHIGAN—Davis, Sekach. MISSOURI—Kierski, IRT; O'Connor, Harvey, James. MONTANA—Steinmetz. NEW JERSEY—NNRC; Wooley; Williams, American QSL Bureau; de Brier. NEW YORK—Strauss, Beck, Legge, Homentowski, Duggan, Casey, Chen. NEW ZEALAND—Cushen, Milne, Christian, DX-TRA. NORTH CAROLINA—Ferguson. OHIO—Sutton, Croston, Gates, Richardson. OKLAHOMA—Walker. ONTARIO—Kennedy, MacKay, Brook, Brooman, Moss. OREGON—Morris. PENNSYLVANIA—Cooley, Bachman, Stokes, Jones, Black, Znaidukas. POLAND—Polskie Radio. QUEBEC—Fletcher, Gauvreau. SOUTH AFRICA—Laubscher. SWEDEN—Skoog, M. Olsson, B. Jonsson, Frick, Swalen, C. Petersson, Gimby, Bergstrom, Mohlin, L. Hansson, Ekholm, Soderholm, Ekblom, Lindhe. TEXAS—Thompson, Rice, Giles. VERMONT—Podall. VIRGINIA—Lundberg, Norris, Mayo. WEST VIRGINIA—Rupert, Gonder.

—50—

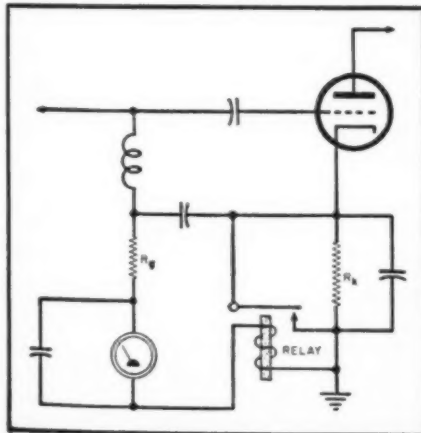
CATHODE BIAS PROTECTION

F. HARRIS of Chicago, Illinois, has developed a method whereby the protective properties of cathode bias may be utilized without loss of plate potential, under normal operating conditions.

He points out that although grid leak bias is desirable in many respects, it has one outstanding disadvantage. If excitation fails, tube failure may result from the excess plate current flow. Fixed bias or cathode bias used in conjunction with grid leak bias is usually resorted to for safety sake but the voltage drop caused by the cathode resistance usually represents a loss in plate voltage which cannot be afforded, hence the need for the circuit design shown.

With normal excitation the relay contacts short out the cathode resistor but if excitation fails, the relay contacts open and the resistor is inserted in the cathode circuit, thus providing the needed protective bias.

—50—



December, 1946

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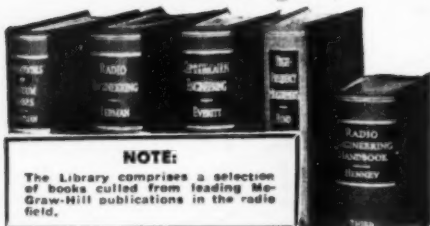
WORLD'S OLDEST AND LARGEST MANUFACTURERS OF RADIO ANTENNAS AND ACCESSORIES.



Statement of the ownership, management, circulation, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Radio News, published monthly at Chicago, Ill., for Oct. 1, 1946. State of Illinois, County of Cook, ss. Before me, a notary public in and for the State and county aforesaid, personally appeared A. T. Pullen, who, having been duly sworn according to law, deposes and says that he is the business manager of Radio News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Wm. B. Ziff, 185 N. Wabash Ave., Chicago 1, Ill.; Editor, Oliver Road, 185 N. Wabash Ave., Chicago 1, Ill.; Managing Editor, Oliver Road, 185 N. Wabash Ave., Chicago 1, Ill.; Business Manager, A. T. Pullen, 185 N. Wabash Ave., Chicago 1, Ill. 2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Ziff-Davis Publishing Co., 185 N. Wabash Ave., Chicago 1, Ill.; A. Ziff, 185 N. Wabash Ave., Chicago 1, Ill.; W. B. Ziff Co., 185 N. Wabash Ave., Chicago 1, Ill.; S. Davis, 185 N. Wabash Ave., Chicago 1, Ill.; Wm. B. Ziff, 185 N. Wabash Ave., Chicago 1, Ill.; B. G. Davis, 185 N. Wabash Ave., Chicago 1, Ill. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is: (This information is required from daily publications only.) A. T. Pullen, Business Manager. (Signature of business manager.) Sworn to and subscribed before me this 30th day of Sept., 1946. [Seal.] Doris Palowsky, Notary Public. (My commission expires April 25, 1949.)

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Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

ESCO CATALOGUE

"Rotating Electrical Equipment," the ESCO catalogue No. 46-1, describes the special motors, generators, motor-generator units, converters, and other rotating electrical products manufactured by *Electric Specialty Company* of Stamford, Conn.

Numerous types of typical units which have been made by the company are illustrated. Since ESCO builds special equipment to specification and order, the catalogue presents the main construction points, uses, and the range of electrical and mechanical characteristics to which other units can be manufactured.

Copies of this catalogue are available from *Electric Specialty Co.*, Stamford, Conn.

STEATITE INSULATOR CATALOGUE

The *General Ceramics & Steatite Corporation* in Catalogue 2000 gives a full description of their Steatite Insulators from the raw material down to the various production methods.

Pillar insulators, bushings, coaxial cable insulators, lead-in insulators, spreader and strain insulators and coil forms are a few of the items that appear on the finger-tab index.

Copies of this 48-page catalogue will be sent upon request to *General Ceramics & Steatite Corporation*, Keasbey, New Jersey.

ELECTRICAL INSULATOR FOLDER

A new folder has been released by the *Continental-Diamond Fibre Company* of Newark, Delaware.

The bulletin, GF-49, presents the company's six non-metallic basic insulating materials, Diamond, a vulcanized fibre; Dilecto, a laminated thermosetting plastic; Vulcoid, a C-D dielectric material; Celeron, a fabric-base molded plastic; Micabond, a bonded product, and Dilectene, u.h.f. insulation.

The pictures, charts, and descriptive data given in this bulletin show the varied applications of *Continental-Diamond* products. A copy may be obtained by writing to *Continental-Diamond Fibre Company*, Newark 49, Delaware.

THE COLLINS SIGNAL

The *Collins Radio Company* has announced that they will, in the very near future, resume publication of "The Collins Signal," a technical magazine published by the company prior to the war.

The "Signal" will carry articles of interest to the broadcast and communication engineer, airline communication

man, the amateur and the radio experimenter. The magazine will be edited by Lew H. Morse.

Engineers or others desiring to be placed on the mailing list to receive "The Collins Signal" should send a postcard to *Collins Radio Company*, Collins Signal Office, Main Plant, Cedar Rapids, Iowa.

TIME SWITCH BULLETIN

An addition to the *Automatic Temperature Control Co., Inc.*, line of time controls is the new time switch which is described in Bulletin T-55.

Examples given in the bulletin to illustrate various types and uses of time switches include units for electronic heating machines, for sub-freezing refrigerator systems, and for a dehumidifying process.

The bulletin may be obtained from *Automatic Temperature Control Co., Inc.*, 54 East Logan St., Philadelphia, Pa.

RESONANT RELAYS

The Type 182 resonant relay, which operates only when energized at a predetermined frequency, is presented by *Stevens-Arnold Company* in Catalogue 116.

Pictures, charts and schematics give a detailed account of the resonant relay. Copies of this catalogue may be obtained from *Stevens-Arnold Company*, 22 Elkins St., South Boston, Mass.

HI-PAR ANTENNA CATALOGUE

A catalogue sheet on the first of a series of new antenna equipment has been issued by *Hi-Par Products Company* of Fitchburg, Mass. The sheet features the *Hi-Par* Non Directional FM Antenna, which can be used with any FM radio and includes a detailed, illustrated description of the unit.

A copy may be obtained from *Hi-Par Products Company*, 53 East St., Fitchburg, Mass.

KENCO TECK GUIDE

The *Ken Cook Co.*, has available for distribution a 24-page *Kenco Teck Guide* on "How to Plan an Owner Manual."

The Guide contains valuable suggestions on what to include in an Owner Manual and how to present the information in the most effective way. It includes sample pages of sectional and cutaway views, flow diagrams, tune-up and maintenance illustrations as well as trouble charts and exploded parts views. The guide may also be used as a work book with space for filling in and laying out the infor-

mation that would apply to the user's particular product and would be of help to the owner of the new equipment.

"How to Plan an Owner Manual" was designed to serve as a sales tool, a promotional aid and as a means to insure continued peak performance of a product after it leaves the manufacturer or dealer. It may be obtained free of charge upon request to the *Ken Cook Co.*, 710 N. Plankinton Ave., Milwaukee 1, Wis.

TEMPERATURE RECORDER BULLETIN

The Type CF-2 inkless temperature recorder recently announced by *General Electric* is described in a new 8-page bulletin, GEA-4572.

Various industrial applications for the new unit, such as recording temperatures in generators, transformers, and ovens are listed, along with complete specifications. A test resistor and resistance-temperature detectors as well as other accessories used with the unit, are pictured and described.

This bulletin is available from the Apparatus Department, *General Electric Company*, Schenectady 5, New York.

LAFAYETTE RADIO FLYER

Lafayette Radio has announced a new flyer listing over 150 scarce items for the radio ham, serviceman, and experimenter.

Ham and home needs have been

stressed with nearly two-thirds of the space devoted to amateur receivers and transmitters, amplifiers and public address systems, home receivers and record changers, radio cabinets, and amplifier and speaker cases, while the last third of the flyer is devoted to radio service and experimenters' parts and supplies.

Flyer C-38, an introduction to catalogue No. 88 recently released, may be obtained upon request to *Lafayette Radio*, 100 Sixth Avenue, New York. Names will be placed on *Lafayette's* mailing list for all future flyers, releases, and catalogues.

SELENIUM RECTIFIER

Federal Telephone and Radio Corporation is currently offering a new bulletin for servicemen dealing with the installation of selenium rectifiers as replacements for rectifier tubes.

In addition to providing pertinent information of interest to the serviceman, the back of the folder has been printed as a poster which the serviceman may use in his shop or show window. Printed in two colors, the poster may be used to attract customer attention to the fact that the dealer is equipped to install the new selenium rectifiers at a nominal charge.

The bulletin also lists other service material which the company has available upon request, including an

8-page booklet which is given free with orders for the rectifiers. This booklet tells, by means of diagrams and pictures, how to install the new units.

A copy of this folder will be forwarded to those requesting it from *Federal Telephone and Radio Corporation*, Newark 4, New Jersey. Ask for the flyer on Selenium Rectifiers.

G.E. VACUUM CAPACITORS

General Electric catalogue ETX-3 describes the complete line of G. E. vacuum capacitors, service-proved for aircraft communication and high altitude applications.

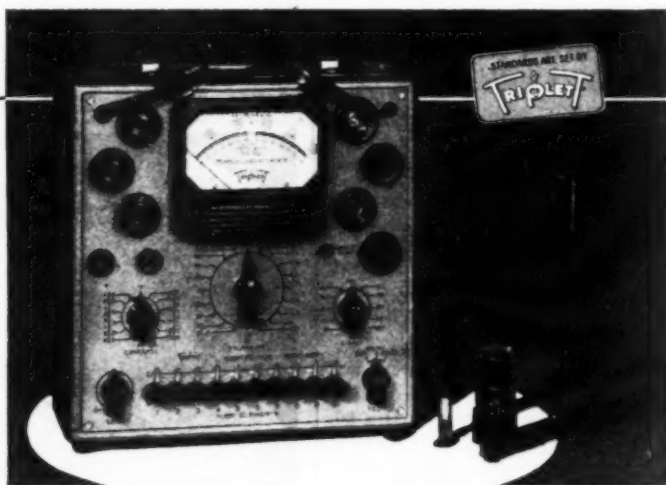
This 15-page catalogue gives prices and ratings, constructional features, outline drawings, performance highlights and applications of these vacuum capacitors.

To obtain this catalogue write to *General Electric Company*, Electronics Department, Schenectady, N. Y.

PULSING DRIVE BROCHURE

Yardeny Laboratories, Inc., has a brochure out on their new Pulsing Drive. This device for the control of electrical motors has a switching control with its main features centralized in a single knob which provides adjustable, accurate inching as well as fast travel both with reversible and non-reversible motors.

The brochure covers all technical data, itemizes typical applications of



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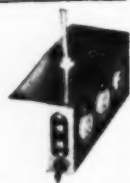


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the pulsing drive and describes its operation. A copy may be obtained from Yardney Laboratories, Inc., 105 Chambers St., New York 7, N. Y.

SELETRON BULLETIN

An 8-page bulletin on Seletron, the Radio Receptor Company's selenium rectifiers, is now available from the Selenium Rectifier Division of the Radio Receptor Co., Inc., 251 West 19th St., New York 11, N. Y.

Detailed illustrations and descriptions of the various types of standard selenium rectifier equipment for direct current requirements are included in the bulletin, as well as complete specifications, sizes and ratings. Schematic diagrams of common circuits in which selenium rectifiers are used are also shown.

-30-

Striking Displays

(Continued from page 31)

shopped the rest of the windows in the Polsky store. From a merchandising standpoint, that probably was its primary purpose and it accomplished that purpose admirably.

In planning a window display it is wise to keep in mind certain psychological factors regarding idea retentiveness of the average human mind. An axiom of specialty selling applies well to getting across an idea via a display—"it's better to stress one sales point 10 times than to mention

STRAIGHTEN CONDENSER PLATES

THE movable plates of the radio variable condenser, called the rotor section, sometimes become bent and make contact with the stator section, or stationary plates.

This usually results in noise or no reception at certain dial points.

This condition may often be corrected by disconnecting the radio from the wall outlet and then using a thin bladed putty knife as illustrated.

Pressure is applied lightly between the bent plates in the required direction. It is best to make this correction a little at a time, rather than trying to do it with one attempt. . . . H.L.



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RADIO NEWS



Many service shops must get their message across fast to the fleeting glance of the passing motorist. Every sign competes with adjacent signs for the motorist's involuntary attention. Displays must stand out against competition in order to click.

10 sales points, each once." Throw too many facts at a prospective customer and you will put him in a state of utter mental confusion. Give him one important fact about your product or your service, and present that one fact from every possible angle and you will stay on the high road toward selling him. In designing a display keep it simple and aim toward getting over that one idea.

The electronics industry offers many fascinating possibilities for effective window displays. How an electric eye operates is still quite a mystery to the average layman. The many potential applications of photoelectric cell tubes in the average home offer unusual opportunities for graphic window displays. An educational and instructive display showing how light beams can detect an intruder would not only create interest but would also recur in the viewer's mind again and again as he reads news accounts of marauders who have stealthily broken into homes to rob and murder. It's not out of reason to assume that such a display would result in many calls from people interested in the protection such an installation would give them.

While television programs are now available only in a few of the larger population centers there will be a growing interest in video as receivers reach the market in growing volume and new stations are built. A traveling light beam that would slowly "scan" a picture could be developed as a display to show how the television camera pick-up scans scenes with the speed of light, then how these impulses are broadcast, picked up by the receiver antenna, and reproduced in the electronically synchronized home television receiver.

Every display that tends to accentuate the radio serviceman's superior knowledge of radio products will help to focus public attention and opinion favorably in the direction of his service and his business.

It's difficult not to associate the

NEW SOLDERING GUN with adjustable tip FOR TOUGH JOBS

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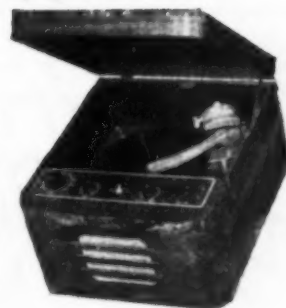
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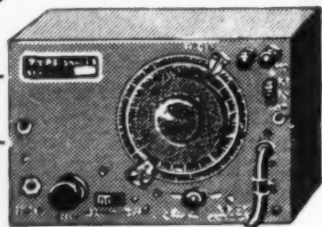
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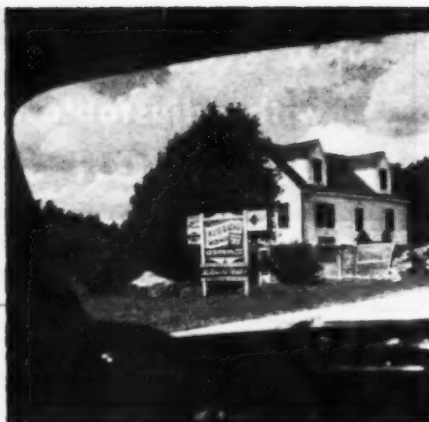
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merchandising of radio service with sale of new receivers. The average serviceman who is merchandising his radio service effectively will also sell new radio receivers. In developing a window display for the purpose of creating new receiver sales, get some punch into your display. As table model receivers have been coming out in greater volume, an increasing number of dealers are filling their windows with 5 and 6-tube sets at a great variety of prices. Such a display hopes to impress on the prospective purchaser the idea that the store can supply a radio to fit most any pocketbook. It presumes that he is ready to buy a receiver. Actually, it seriously confuses the average individual who is interested in a new set.

Maintain a singleness of purpose when you develop a window display of new radios. Highlight one set and show as graphically as possible how that particular set is the best 'buy' available. Get the idea over that that one set is 'the jewel' among current radios of its type and you will help the interested prospect to decide to walk into your store to see about it.

Sylvania Marketing Surveys indicate that during the 1930's, radio service dealers sold about 30% of all the new radio sets purchased by home users. The dynamic nature of our economy will materially change the marketing picture of many products as we roll further into the postwar years. It's apparent from plans already announced that many new retail outlets for home receivers will be vying for sales in this market. Every device of modern merchandising will be employed by the major retail stores to stimulate their sales of radios.

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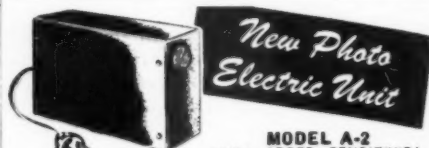
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that spark of zeal that impels others to study *all* the factors that make a business operation successful and the driving force to apply these techniques to their own businesses.

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-50-

Square-Wave Generator

(Continued from page 49)

This waveform is now introduced into a cathode follower. As the waveform was inverted by the pentode the cathode follower can square up the other side of the waveform. The cathode follower cannot swing very far negative, so it will clip the other side of the square wave. This results in an output square wave which has very sharp rises and falls. Of course, there is a limit to the frequency at which the square-wave generator will operate and still produce an output wave which is square. The frequency components in the square wave extend much higher than the fundamental frequency. For the square wave to look square it must contain a minimum of frequency components, ten to twenty times higher than the fundamental frequency. A ten thousand cycle square wave will, therefore, contain frequencies from 10 kc. to 100 or 200 kc. and may extend to a megacycle or higher. As a matter of fact, the multivibrator may be picked up on a broadcast receiver.

The higher the frequency components, the steeper the rise and fall of the square wave. Therein lies a part of its usefulness. The square wave may be introduced into an amplifier and the amplifier's output inspected. If the amplifier has poor high frequency response or phase distortion, a comparison of the square wave introduced into the amplifier's input and the square wave from the amplifier's output will show up as a decrease of the rises and falls of the square wave. Fig. 3B is a typical example.

The flat top of the square wave is an indication of the low frequency components. If a 30 cycle square wave is introduced into the amplifier under test, it will have to have a response characteristic flat down to ten or fifteen cycles for the top of the square wave to be flat; otherwise, there will be a slope on the top of the wave (Fig. 3B). It becomes relatively simple to compare an amplifier with a standard and to note any deviation from results



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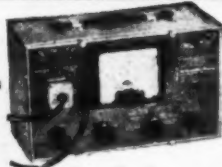
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obtained therefrom. Lines representing the slopes of the top and sides of the square wave may be drawn on a piece of transparent material and placed on the front of the scope.

This method of investigating the response of an amplifier is much more quickly performed than the usual method of taking measurements at many points with a signal generator and output voltmeter. Of course, it is not as precise, and constitutes a qualitative measurement, but it will quickly show major deviations from proper operation.

This square-wave generator is built on a chassis 8" x 8" x 2". The power supply is located along the back edge, and the tubes are lined up in back of the panel so that they will be close to the controls mounted on the panel.

The frequency of the multivibrator is varied by means of a dual potentiometer which changes the resistance simultaneously in the two multivibrator tube grids. As it is not good to cover too great a frequency range by the variation of this resistance, the capacitors in the grids of the multivibrator tubes are switched. Two ranges have been provided, extending from 25 to 3500 c.p.s. If a wider frequency range is desired, it may be added. It is feasible to include a range that goes as high as 50 or 100 kc., if the builder wants to apply square wave testing to video or wide band r.f. amplifiers. Small capacitors are merely switched into the same circuit.

The leads should be short and direct and kept away from the chassis to decrease unwanted circuit capacity. All of the circuits should be grounded to the common ground lug instead of depending upon the chassis for ground. The dial calibration is reproduced on page 48, and if the values are followed closely and the layout adhered to, it can be copied and pasted to a dial, or the unit can be calibrated if high accuracy is desired. The photographs appearing on page 49 show the author's manner of construction.

The power supply is conventional, except for the larger filter condensers. These are essential to eliminate common coupling in the power supply circuit, and the attendant introduction of unwanted products of one tube in the plate or grid circuit of another.

The use of a square-wave generator presupposes the user has an oscilloscope, as its uses require visual observation. The scope may be synchronized more solidly and accurately with a square wave or a differentiated square wave, because the synchronizing points are more accurately defined in time.

The rise of the square wave being so fast provides a nice synchronizing voltage if it is introduced to the sync input to the scope through a very small condenser (.00001 μ fd.). This is also true when it is desired to synchronize a free running multivibrator. The multivibrator slips when its grid voltage rises to a certain voltage. If an external recurrent synchronizing

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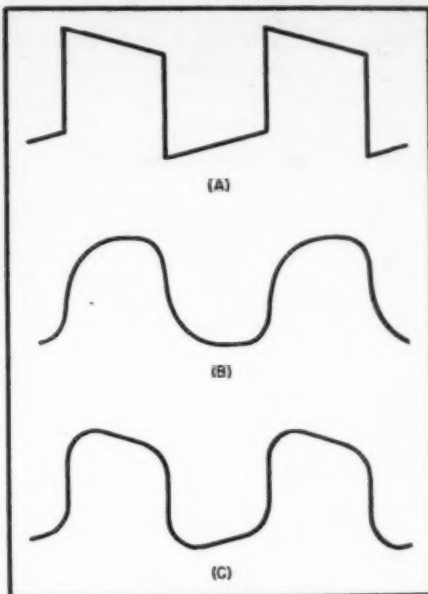


Fig. 3. Waveforms illustrate distortion present in square wave. (A) Poor low frequencies. (B) Unfavorable high frequencies. (C) Bad high and low frequency response.

voltage is introduced to its grid, it will flip sooner.

Therefore, a multivibrator may be locked in step with a synchronizing pulse, provided the frequency of the pulse is higher than that at which the multivibrator would run free. If that pulse is steep, the multivibrator frequency will be accurately determined by the frequency of the external frequency source.

The square-wave generator has many other uses which will come into more general usage as television circuits become more common, because the television signal is really a series of pulses, the fronts and durations of which determine the proper sweeping of the cathode-ray tube to produce a picture on its screen.

It is also useful in placing a signal on the intensity grid of the cathode-ray tube in an oscilloscope, to constitute a calibrating method for measuring the spacing or frequency of an unknown wave. It would alternately blank and unblank the trace on the scope and be apparent by producing a trace which is composed of a series of equispaced dashes on the screen instead of a solid line. If the frequency of the square wave is known, then it may be readily compared with the frequency of a wave introduced on the vertical plates. This is very useful when the sweep in the scope is not linear, as most of them are not at low frequencies.

The square-wave generator may operate an electronic switch to observe, alternately, two waveforms on the screen of a scope for direct comparison. This would constitute a convenient method to compare the input and output of an amplifier under inspection.

Use will suggest a host of other applications for this versatile square wave generator.

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Crystal Controlled Signal Generator

(Continued from page 43)

imately 50 per-cent while on the 1000 kc. channel modulation is close to 100 per-cent. The higher percentage on the 1000 kc. assures good tone strength at the higher harmonics used in short-wave alignment. External crystals used with the oscillator will also be modulated heavily. It is noteworthy that with crystal control there is a negligible amount of carrier shift, or frequency modulation even with 100 per-cent modulation. Thus the tone will appear on the carrier frequency and not above or below it.

With the modulation control set at "PURE RF" there is naturally no modulation present on the r.f. output. The audio output jack on the panel carries the internal audio tone in this position and may be used for signal tracing through the audio stages of receivers or amplifiers, or wherever an audio signal is needed. The amplitude of this signal is approximately 7.5 volts r.m.s. at an impedance of about 50,000 ohms.

In "EXT. MOD." position the internal audio is inoperative, and the r.f. output may be modulated by an external audio signal coupled into the audio jack. A modulating voltage of about 7.5 volts is required for 100 per-cent modulation although satisfactory modulation will result with as low as 2 volts. This feature may be used conveniently in testing phono pickups or microphones by coupling them into the audio jack, setting the switch to "EXT. MOD." and monitoring the r.f. output in a receiver. Fidelity of modulation will be excellent because of the low carrier shift with crystal control.

Fig. 2 shows the circuit diagram of the signal generator. Two tubes are used, a 12SK7 as an oscillator and a 35Z5GT rectifier. The oscillator is designed to provide maximum isolation of the crystals. This is done by using grid 2 as the oscillator anode, and simply electron coupling to the plate and output circuits. As a result there is no danger of injuring the crystals through accidental application of voltage to the output leads. Grid 3 controls the electron stream to the plate, providing modulation when an alternating voltage is applied to it.

The internal modulation is supplied by a ¼ watt neon tube relaxation type oscillator at approximately 400 cycles. Its stability is maintained through a decoupling network adjusted for 100 per-cent modulation of the 1000 kc. channel.

Direct current to the oscillator is furnished by the 35Z5GT rectifier. The circuit is a conventional a.c.-d.c. type with the common negative bus floating above the chassis. This allows the chassis and cabinet to be grounded externally, eliminating the danger of shocks so commonly associated with a.c.-d.c. circuits. The tube heaters are connected in series across the line.

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Technical BOOKS

"MOST - OFTEN - NEEDED 1946 RADIO DIAGRAMS" by M. N. Beitman. Published by *Supreme Publications*, Chicago. 192 pages. Price \$2.00.

The book contains circuit diagrams and parts lists for home radio receivers manufactured from VJ Day up through June, 1946. While many manufacturers are not represented, the text contains information about the products of 47 companies.

This volume, which is the sixth in the series, is the first to be published since the resumption of home receiver production. Servicemen will undoubtedly find this book of help when the new receivers start appearing in the service shops for repairs and adjustments.

"REFERENCE DATA FOR RADIO ENGINEERS." Second Edition. Published by *Federal Telephone and Radio Corporation*, New York. 322 pages.

The second edition of this reference book has been greatly expanded to include important new developments which have been made since the first edition made its appearance in August of 1943.

In order to provide the user with more complete information than was available in the first edition, the engineering staff which compiled this material, added chapters on transformers and acoustics; expanded the sections on vacuum tubes and amplifiers; included additional information on cathode-ray tubes and enlarged the treatment of wave guides and resonators, and divided the chapter on radio propagation and antennas into two separate units, each greatly enlarged and amplified.

All of the material has been brought up to date and additions suggested by the readers of the first edition incorporated in order to provide full coverage of all of the subject matter likely to be useful to the radio engineer.

This book represents an "in-the-pocket" reference library for the radio engineer, and as such should find wide acceptance by those whose work requires on-the-spot availability of formulas, tables, etc.

"COYNE RADIOMAN'S HANDBOOK," compiled by the Technical Staff, Coyne Electrical School. Published by *Coyne Electrical School*, Chicago. 345 pages. Price \$3.25.

While a book of this type is difficult to review, it is not hard to evaluate. This text is, in the true sense of the word, a handbook. The compilers have gathered together under one cover thousands of facts and figures pertaining to the repair, design, installation, assembly and servicing of radio equipment. While the subjects covered are too numerous to mention individually, suffice it to say that the compilers have presented tables, charts, graphs, etc.,

December, 1946

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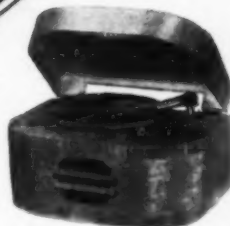


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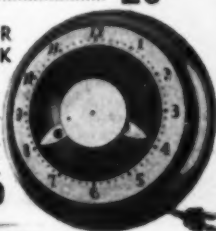


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In addition, one section is devoted to the commonly used abbreviations and symbols found on circuit diagrams, tube symbols, screw, drills and sheet metal data, conversion tables, square roots, trigonometric functions and the use of formulas.

From the scope of the book, briefly outlined here, it may be safely assumed that this book would serve equally well the student, radio serviceman, amateur, designer, engineer, or layman.

"CAPACITORS" by M. Brotherton. Published by D. Van Nostrand Company, Inc., New York. 104 pages. Price \$3.00.

As Dr. Brotherton points out in the introduction to this book, there has long been a need for a text which could be used as a practical guide to the proper selection of capacitors for various electronic applications.

This book is not written for the engineer who designs or supervises the manufacture of capacitors, but for the man who must decide which capacitor shall be used for the job at hand. One of the most valuable chapters in the book, from the viewpoint of the "practical" man, is the one entitled "Twenty Keys to the Right Capacitor." Here Dr. Brotherton has listed the important points which must be considered by the engineer or designer.

While this text cannot be said to be an elementary treatment of the subject, the material is presented in such a way that it might easily be used by the student and serviceman. The writing style is lucid and the author has taken the time to explain capacitor behavior thoroughly.

—30—

ERRATA

In Fig. 2, page 116 of the September issue, resistor R_2 should run directly to ground instead of to the cathode. The lower end of primary of T_1 should be connected to ground. Paragraph 4 of the text should read R_1 , instead of R_2 .

On page 39 of the October issue, the value of L_1 in Fig. 2 should be 20 microhenries instead of millihenries.

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